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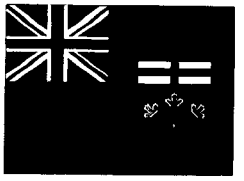

LTPP Specific Pavement Studies

Construction Report on
LTPP 870900, SPS-9A Project,
Petawawa, Ontario
Summer 1996 - Summer 1997

Report No. FHWA-TS-98-87-02

March 1998

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Construction Report on LTPP 870900, SPS-9A Project
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15. Supplementary Notes

The SPS Project 870900 is a part of the Specific Pavement Studies SPS-9A, Superpave Asphalt Binder Study. It is located in the Wet-Freeze Environment Zone of the Federal Highway Administration's Long Term Pavement Program.

16. Abstract

Project 870900 is located on the westbound lane of the 2-lane Highway 17, between the Buchanan Twp. Line and County Road 42 (Pembroke), Renfrew, Ontario. There are three 152m long SPS-9A experimental sections and three supplemental agency test sections in the 4.25km construction contract. Smith's Construction Company Arnprior Limited, Arnprior, Ontario was the prime contractor. The contract was advertised on May 29, 1996 and tenders closed on June 27, 1996. The binder course was placed between October 16, 1996 and November 1, 1996. The paving of the surface course was carried out between June 9 and June 18, 1997. Traffic was maintained during construction.

This report includes descriptions of the layout of the test sections, details of materials sampling and field and laboratory testing plans. Construction equipment used on the project is named and construction dates and sequences are described. A SPS Project Deviation Report is included as Appendix A.

17. Key Words	18. Distribution Statement
LTPP, SPS-9A, Superpave, Gyratory Compaction, Superpave Regional Test Center, HL4 Binder Course, HL3 Modified Surface, 19mm Superpave Binder Course, 12.5mm Superpave Surface Course	

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Ministry of Transportation Contract Number 96-25

INTRODUCTION

The Ministry of Transportation of Ontario (MTO) Hot Mix Paving Contract 96-25 is located on Hwy. 17 from 8.4km east of Chalk River (Sta. 9+885) easterly to 3.0km east of Renfrew Road #28 (Sta. 26+735) a distance of 16.9km. Within this contract, the SPS-9A FHWA-LTPP Project consisting of 6 test sections is located on the westbound lane at the extreme west end of the contract for a distance of 4.25km (Sta. 9+885 - 14+135). A concrete pad used for tank crossings is located at Sta. 14+135m. The SPS-9A Project is located 150km west of Ottawa, Figure 1. Highway 17 at the FHWA-LTPP location, by-passes the Town of Petawawa but divides the Petawawa Military Reserve Base which is used for various military training purposes.

Highway 17 is a two-lane east-west arterial highway. The Annual Average Daily Traffic (AADT), two directions is 4500 with 14% heavy trucks and truck trailer combinations. The estimated 18k ESAL rate in study lane is 177 and the total design 18k ESAL applications in the design lane is 2.65×10^6. The design period is 15 years.

The topography is flat to gentle, rolling. The test sections are located on the Petawawa sand plain. It is a glacial fluvial outwash and deltaic deposit containing sand and gravel but the test sections are located on a well-drained sand whose depths are greater than 20 ft. as determined by the shoulder probes.

The contract documents were prepared by the MTO Regional Staff in Kingston, Ontario. A Task Force co-chaired by Dr. Kai Tam, Manager of the Bituminous Section and Mr. Tom Kazmierowski, Manager Pavements and Foundation Section was formed to assist with the preparation of the Special Provisions for the FHWA-LTPP Project which were incorporated into the contract documents. Mr. Anil Virani, Sr. Bituminous Engineer, Engineering Materials Office was the Project Manager on technical aspects of the project. The FHWA-LTPP Regional Coordination Office Contractor (RCOC) was ITX Stanley Limited. Pavement Management Systems Division (William Phang and Edward Lesswing) provided information and attended the Task Force Meetings as required.

The FHWA-LTPP Experimental Design and Research Plan for the SPS-9A Superpave Asphalt Binder Study, revised September 1995, was followed. Ministry of Transportation selected the thermal cracking distress for the selection of the alternative binder. Three required core test sections plus 3 supplemental test sections were included in the contract.

The first test section #1, was designated as the control using the MTO Marshall Mix Design with 85/100 pen graded AC, the second, #2, was the Superpave Mix Design with PG 58-40 AC and the third, #3 with PG 58-34, the alternative binder to test for sensitivity on the asphalt cement specification. For the Petawawa Region, the Superpave calls for a PG 58-46 asphalt cement. However, since this particular grade of asphalt cement is still considered experimental and not readily available and since pavement temperatures are expected to be somewhat higher than the air temperature, Ministry MTO decided to use a PG 58-40. (This is now in accordance with the revised LTPP temperature algorithm).

Three supplemental test sections were included in order to compare the magnitude of improved long-term performance provided by the mixture designs and specification criteria. Section 60 downgraded the Superpave specification to a PG 58-28 because it was considered that PG 58-34 is too high and is not warranted in every situation. Section 61 was designed to test the performance of polymer asphalt versus PG 58-34 without polymer. This section serves as a direct comparison with Section 03, a polymer modified PG 58-34 asphalt binder. Section 62 uses a Standard MTO Mix Design and substituting a PG 58-40 for the typical 85/100 (Pen graded asphalt) thus giving the opportunity for a direct comparison to the control section 01.

Contract 96-25 was advertised on May 29, 1996 and the tenders closed on June 27, 1996. In view of the importance of ensuring that the successful bidder had the resources to provide adequate quality control during construction of the test sections, the Contractors wanting to bid were required to submit a satisfactory quality control plan by June 11, 1996. This plan would be evaluated by MTO to determine whether the requirements of the contract could be met. Contractors with an acceptable quality control plan would be allowed to bid on the contract.

Four Contractors were given permission to bid. Smith Construction Arnprior (acquired by Miller Paving during the bidding stage) was the successful bidder. Their quality control plan is shown in Appendix A. The contract allowed for 55 working days resulting in a contract completion date of October 25, 1996

The Contractor retained DBA Engineering Limited Consultants as a sub-contractor to carry out the Bituminous sampling and QC testing of the hot mix and asphalt cements, field nuclear density tests, and the Profilometer tests. Survey Consultants Janato Patrick and Associates were hired to do the 5-Point elevation surveys

In 1996, the Contractor team consisted of Mr Allen Smith, Quality Control Manager, Mr Bruce Kenney, Plan Administrator, Mr Herb Villneff, Quality Control Technician, and Mr Brian Emon, Asphalt Paving Foreman. For the Sub-Contractors, DBA Engineering Limited, Mr. Jeremy Demello was the Laboratory Supervisor (Laboratory was located at the Plant). Mr. Alex Quin, and Mr. Keith Buth were Laboratory and Field Technicians and Mr Merv Morris operated the Profilometer. Mr. Perry was the Surveyor for Janato Patrick and Associates.

In 1996, the MTO construction team consisted of Mr. David Pearson, Head of Quality Control Section Eastern Region Mr. Mike Gallagher, Contract Administrator, Mr. Pat Carroll, Quality Assurance Officer, Mr Glenn Headley, Inspector and Mr Shane Cassidy and Mr Bob Buck, Laboratory Technicians.

The Asphalt Binder Course was generally placed under poor weather conditions. There was some urgency in covering the reclaimed millings and granular base prior to onset of winter. The Binder

Course of the last test section was placed on November 1, 1996. Due to the unpredictable weather conditions in the Petawawa area for the month of November, the Contractor requested permission to delay the placing of the Surface Course until the Spring of 1997. This request was granted.

Because of a wet and cold Spring and a high water table in the plant area of the pit, the working days did not re-start until June 2, 1997. The Contractor had replaced the Asphalt Foreman with Mr. Maurice Duplissi and had taken over the responsibility from DBA for obtaining the hot mix road samples and delivering them to the Laboratory and for carrying out the Nuclear Density tests. These were carried out by Ms. Kelly Dechert. DBA had replaced their 2 Laboratory Technicians with Mr. Mark McClelland and Mr. Jason Raymond.

During the Winter of 1996-97, MTO went through a period of downsizing. All of the Regional and field testing Laboratories were closed and the testing equipment sold. All of the QA Bituminous hot mix samples were scheduled to be sent to the MTO Downsview Laboratory (8721), but the MTO Lab could not carry out the extraction test with trichloroethylene for environmental reasons. The QA samples were therefore split. The extraction and the gradation tests were carried out by Paterson Materials Consultants in Ottawa and the volumetric tests were done in the MTO Laboratory in Downsview The MTO Project Staff had also undergone a change. The position of Contract Administrator was abolished. Mr. Glenn Headley became the Construction Control Officer (CCO) and Mr Welch became the Inspector.

The FHWA-LTPP portion of this contract was the last to be completed. Paving was completed on June 19, 1997 which was accepted as the last working day of the contract

This contract followed end result specification requirements involving bonuses and penalties. All of the sampling and field testing requirements for the FHWA-LTPP Project were included in the contract documents The Contractor was responsible for carrying out the QC Field Sampling and Testing and MTO for QA testing The pre-construction sampling was carried out by Mr. Basel Abukhater and the construction inspection by Mr. Alex Rutka, ITX Stanley Limited, Pavement Management Systems Division, the FHWA-LTPP North Atlantic Region Contractor

Seasonal monitoring instrumentation to record air and pavement temperature as well as moisture (not required by LTPP) for evaluation of climate-pavement relationships was installed at 2 locations by Mr Ken Bannerman, Research and Development Branch

⇒ Site A at Station 10+025 (Northern site)

⇒ Site B at Station 12+235 (Southern site)

Both sites have 7 thermocouples below the surface, and 2 moisture probes, Photo 10 Site A has telephone/modem communications to Downsview and the site has AC power with battery backup. Site B has solar powered operation with battery backup The data collected at site B can be transmitted by radio link to Site A and then transferred and down loaded by Modem to the Downsview office

The detailed layout of the instrumentation is shown in Appendix B. The WIM was installed in both the eastbound and westbound lanes at Sta. 10+100 between August 12-14, 1997 under the direction of Mr. Ataur Bacchus, Research and Development Branch. The equipment was made and supplied by International Road Dynamics (IRD) Saskatoon, Saskatchewan. The highway is a 2-lane road and excellent traffic protection was required and provided.

PROJECT DETAILS

Layout

The layout of all the 6 test sections showing the Mix Designs and the Asphalt Binder required for each test section is shown in Figure 2 of the SPS-9A Materials Sampling and Testing Plan (and also Figure 10, which is sheet 3 of the contract documents).

MATERIALS SAMPLING AND TESTING PLAN

The Materials Sampling and Testing Plan issued on December 10, 1996 and revised on May 14, 1997 (by correspondence with Mr. Ed Lesswing) was followed during the course of construction. The May 13, 1997 change reflects the submission of Gyratory Compacted Specimens to the Materials Reference Library instead of the Superpave Regional Test Center. Also the "Interval A" cores that were to be sent to the Superpave Test Center will not be taken until further notice. These changes were necessary as the Superpave Regional Test Center testing procedures have not yet been finalized.

The Materials Sampling and Testing Plan is included in this report contains the following information:

Figures 3-8	The Location of Field Sampling and Testing of each layer of the 6 test sections.
Table 1	Pavement Structure
Tables 2-11	These Tables cover a wide range of activities including Field Sampling, Field Testing, Laboratory Testing Requirements by MTO, LTPP Contractor Laboratory, Superpave Regional Test Center and shipping of samples for the Materials Reference Library (MRL)
Tables 12-23	Laboratory Tracking Tables of Samples or Specimens for Subgrade, Subbase, Base, Aggregates, Binder, Mixes and Cores for MTO, LTPP Contractor Laboratory and the Superpave Regional Test Center.
Table 24	Summary of Gyratory Compaction Specimen ID's

CONTRACT DOCUMENTS

The contract documents for Contract 96-25 incorporated all of the requirements of SPS-9A projects in considerable detail in items related to mix designs, field sampling and testing, quality control and to the requirements of the final product.

The contract documents also included a schematic profile of the whole contract, Figure 9 (sheet 2), a general layout of the SPS-9A test section, Figure 10 (sheet 3) similar to Figure 2 of the Materials Sampling and Testing Plan, and a typical Test Section Paving of all of the test sections, Figure 11 (sheet 4). A summary of the locations, method of mix design and the type of asphalt binder to be used in both the binder course and surface course is shown in Table A. Table B (Table C of the contract documents) shows the Superpave aggregate requirements.

The existing pavement consisted of about 150mm (6") of bituminous hot mix, over a variable depth of granular base over a poorly graded sand subgrade. The construction involved milling of 60mm (2-1/2") of pavement which was placed on the shoulder and then pulverizing the remainder of the pavement with granular base to a depth of 200mm (8") and then placing a 65mm binder course and a 65mm surface course. The westbound pavement lane is 3.75m wide with a 1.15m partially paved 3.0m shoulder.

PRE-CONSTRUCTION SAMPLING

Shoulder Probes

The boreholes were taken by Mr. Basel Abukhater at the edge of the pavement at the mid-point of each test section on June 6, 1996 The power auger was supplied by Inspec-Sol (ON) Limited Contractors. The soil consisted primarily of poorly graded fine sand in all of the boreholes to depths exceeding 20 feet. (Data Sample Sheet 9 provides the detailed stratigraphy of the test holes)

SAMPLING AND TESTING PRIOR TO PAVING

Base, Subbase and Subgrade Samples

The bulk samples were taken on October 3, 1996, after the existing pavement was pulverized, with a backhoe and with personnel supplied by the Contractor The details of the bulk sampling are contained in Sampling Data Sheets 12 and are summarized in Table 25

Samples were taken of each layer of every test pit except for the subbase Four of the six test pits had a granular subbase but only one test pit (section 03) had a sufficient depth of subbase to obtain a good sample Each sample consisted of 2 bags with a moisture sample in each bag Five 19 liter pails of pulverized base were taken for the Materials Reference Library from the test pit in test section 02 All of the samples were shipped to the MTO storage building at the Downsview Laboratory in December 1996

The depth of existing pavement (as shown in Sample Data Sheet 12) varied from 130-160mm with an average depth of about 150mm 60mm (2 5") was milled and placed on the shoulder and the remaining 90mm was pulverized and mixed with the underlying granular "A" to form a 200mm (8") pulverized base Any remaining granular 'A' after pulverization was considered to be subbase

MIX DESIGN AND FIELD VERIFICATION

Asphalt Plant and Materials

The asphalt plant and gravel pit is located on Portage Road and is owned by Smith Construction. It is located on property known locally as the Smith Turcotte Pit. The pit and plant are located 4km south of Highway 17. Entrance from Highway 17 is on Murphy Road which then terminates at Portage Road.

The plant is a 5000lb. Pioneer batch plant capable of operating at a nominal capacity of 150 tons per hour, Photo 1. The coarse and fine aggregate was obtained from the Trucotte pit and the screenings from Spratt. All of the Asphalt binder was supplied by McAsphalt Industries. All of the PG Asphalt cements except PG 58-34 in section 61 contained polymer.

Mix Design and Job Mix Formula (JMF)

The hot mix designs and the hot mix design reports recommending the JMF were prepared by DBA Engineering Limited.

The mix design reports were completed as follows:

⇒ HL4 Binder Course - September 3, 1996 (Section 1, 62)

⇒ HL3 Modified Surface Course - September 15, 1996 (Section 1, 62)

⇒ 19mm Superpave Binder Course - September 23, 1996 (Section 2)

⇒ 12.5mm Superpave Surface Course - October 4th and 19th, 1996 and June 2, 1997 (Section 2, 3, 60, 61)

The JMF and mix design reports for the Superpave surface course is shown in Appendix C. (Reports for Binder course and other mixes not included in this report are available from the NARO office).

The JMF are shown on the following Tables

⇒ **Table 26** - HL4 Binder Course

⇒ **Table 27** - 19mm Superpave Binder Course

⇒ **Table 28** - HL3 Modified Surface Course

⇒ **Table 29** - 12.5mm Superpave Surface Course

Field Verification and Adjustments to JMF

A 300 ton trial section of HMA was placed with each of the mixes and 2 of the trial sections were repeated to determine whether the as-produced HMA conformed to the tolerance limits permitted by the specifications. These trial sections were placed as follows:

⇒ **HL4 Binder - September 1996**

⇒ **19mm Superpave Binder - October 11, 1996**
There was too much pick-up with the pneumatic roller and the finish was not satisfactory.

⇒ **19mm Superpave Binder - October 17, 1996**
A second attempt. The Contractor added a tank holding water and a liquid detergent which was sprayed on to the front row of rubber tires. There was still some pick-up depending upon the pavement temperature.

Mr. Twiab Khan FHWA-LTPP Coordinator arranged for a Superpave seminar at Pembroke and over 100 attendees had observed the laying of this trial section.

⇒ **HL3 Modified Surface - October 18, 1996**

⇒ **12.5mm Superpave Surface - October 26, 1996**

Following the review of the Laboratory test results of the 12.5mm Superpave surface course trial mix, Mr. Anil Virani noted that the void content was low and that the mix needed adjustment. DBA carried out additional testing and revised the JMF on June 2, 1997 (Appendix C) This revised JMF was used in laying a new 300 ton trial section on June 5, 1997 This revised JMF was used on all of the Superpave surface test sections.

GENERAL NOTES ON CONSTRUCTION

The dates of sampling, field testing and construction are shown in Table 30 It is significant to note that:

1) The pulverized base was exposed to traffic from 32-47 days prior to paving
2) Paving was carried out over 2 construction seasons, the binder course was placed from October 16 - November 1, 1996 and the surface course from June 9-18, 1997

Fine Grading

The pulverization of the base of all of the test sections was completed by September 19, 1996. The base was rough graded and exposed to traffic until the test sections received the binder course between October 16 and November 1, 1996 The pulverized surface developed pot holes and roughness very quickly and a grader was used almost continuously to maintain a reasonably good riding surface.

Fine grading was carried out on the day of the paving to remove the pot holes and roughness that developed overnight and to establish the appropriate cross-fall The longitudinal center line grade usually remained and if any adjustment to the cross-fall was required, it was made by cutting or by the addition of granular 'A' from a truck that was standing nearby

The fine grading was carried out simultaneously for the eastbound and westbound lanes with 2 CAT graders. If the surface was too hard for the graders, water was added to soften the surface. When the surface had a frozen crust, a pulverizer was used to loosen the surface, Photo 2. As soon as the cross-fall was established, the base was compacted with a Raygo Rascal Compactor. Some stoppage of the paving occurred to allow time for fine grading especially at the approach to the monitoring sections so that the paving within could be carried out without a stop. One test section, Photo 3 was scheduled for each day of paving. The westbound lane was laid first in the direction of traffic followed by paving of the eastbound lane in the opposite direction of traffic, Photo 4. Photo 5 shows measurement of compaction of the finished fine-graded pulverized base using nuclear density equipment.

5-Point Levels

Five-point levels were taken by the survey firm, Janato Patrick and Associates, of the pulverized base, binder course and surface course. Each monitoring test section was laid out with 2" x 2" stakes set out at 15m offsets and at 15.2m intervals. Set 4 Sokkiska Total Station instrument was used to determine the elevation.

The instrument was set up over each stake. The elevation came from a nearby bench mark, a 90 degree turn made from the staked base line and elevations taken at the required offset. The data was stored on a disc and downloaded to produce the print out for the binder and surface course thicknesses.

The 5-point level survey of the base was often rushed because of the limited time between grading and binder course paving. At times the paving operation stopped until the levels of the base could be taken, Photo 6.

Binder course levels were taken twice, the first time soon after placement in 1996 and again in 1997 just prior to placement of the surface course. All the levels taken are shown in Construction Data Sheet 15 Layer Thickness Measurements. In general, the 2 binder course elevations for all of the test sections are reasonably close and within 6mm except for the isolated shots and except for section 01. At 0+00 of section 01, the line for 1997 shows a difference in elevation of 25mm less than in 1996. This seems to be a recording error. It had no influence on the final thickness of the surface course.

The average thicknesses of the binder and surface courses are shown in Table 31

Asphalt Paving

The following equipment was used in placing the binder course in 1996 (Photo 3)

⇒ MTV Roadtex 5B 2500 (Shuttlebuggy)
⇒ CAT AP 1000 Asphalt Paver
⇒ Dynapac CC 42A Double Drum Steel Vibratory Breakdown Roller
⇒ 20T Dynapac CP221 Pneumatic Intermediate Roller
⇒ 30T Bros Pneumatic Final Roller

For the surface course paving in 1997, the Blaw Knox PF510 paver replaced the CAT AP 1000 paver and a 30T Dynapac final roller replaced the 30R Bros roller. A 9T Galion steel-wheel tandem finishing roller (Photo 9) was used to remove the ridges left by the breakdown rollers as and when required.

Binder Course

The binder course was laid from October 16 - November 1, 1996, mostly under unfavorable weather conditions, Table 32. The pneumatic roller tires were warmed up with hot aggregate placed along the shoulder of the road at the start of each day's operation. No laying and compacting problems were encountered with the non-polymer mixes.

The polymer mixes were sticky. There was no problem of compacting with the breakdown roller but there was considerable pick-up with the intermediate roller when the mix was hot even with the application of a cold, soapy water spray. Prior to breakdown rolling, the grader raised shoulder material up against the edge of the uncompacted mix, Photo 11

In order to establish a rolling temperature for the intermediate roller, 2 people were required; 1 person to obtain the temperature ahead of the rollers and the other person behind to stop the roller when pick-up was noted.

When pick-ups occurred, they were repaired with hot mix and compacted with a vibratory roller. Pick-ups often occurred at forward stops of the roller, Photos 7 and 8

A summary of the binder course construction data is shown in Table 32. The highlights of the hot mix plant and the rolling compaction temperature data is as follows:

⇒ Mixing - 143-165° C at Plant
⇒ Laydown behind the paver - 130-140
⇒ Breakdown roller - 110-120
⇒ Intermediate roller - 57-92
⇒ Final roller - usually below 60
⇒ Tire pressures - Intermediate and final rollers - 70psi

The nominal thickness of the hot mix for test sections 01 and 02 was 80mm expecting to obtain a compacted thickness of 65mm Automatic grade controls were used on these 2 sections From the tonnage placed and from the 5 point levels, it was discovered that the compacted thickness averaged over 80mm The automatic grade controls were discontinued for the remaining test sections in favor of following the contours of the existing base The nominal thickness remained at 75-80mm with an average of 78mm

Densities of the binder course were taken a few days after placement and are summarized in Table 33

Surface Course

The surface course was laid between June 9-18, 1997. The existing pavement was broomed and received a SS1 tack coat diluted with 50% water at the rate of 0.35 L/sq.m, Photo 12. The mixing temperature varied from 150-160° C depending on the tenderness of the mix during compaction. The laydown temperature varied from 117-129° C. Due to the short haul time of 20-25 minutes, there were always a sufficient number of trucks on hand to feed the paver. The load to unload time of the monitoring section varied from 30-60 minutes and the time to pave varied from 53-85 minutes. The summary of the Bituminous Surface Course Construction Data is shown in Table 34.

The breakdown roller could roll right up to the paver but usually stayed back 25-50m to get a good run to obtain a smoother surface. The tire pressure for the intermediate 20T roller and the final 30T roller was 70psi. The distance between the intermediate roller and the breakdown roller varied from 25-30m depending upon the mix and the temperature of the pavement when pick-up occurred. A 9T Galion steel-wheeled tandem finishing roller was used as required to level out the ridges formed by the breakdown roller. These ridges were the source of pick-up if not leveled.

Because of the pick-up problems with the pneumatic roller in the binder course mixes, the Contractor installed a propane tank to heat the water detergent mixture (2-1/2 gal. Ivory soap to 50 gal. water). The same pick-up problems existed with the surface course except that the pneumatic roller could start rolling at 70° C instead of 60. The extent of pick-up depended upon the mixes. There was no pick-up with the conventional and non polymer mixes but the pick up increased with an increasing amount of polymer in the mixes.

A second trial section of the 12.5mm surface course with a revised mix design was placed on June 5, 1997 to a nominal thickness of 78mm which compacted to a thickness of 63-68mm as determined from core data. The 78mm nominal thickness was therefore established for the test sections. It was not until the laying of the hot mix at the mid point of section 03 that it was discovered that the compacted thickness of section 02 was 59mm (Table 31) which was at the lower limit of the design thickness specification of 65mm +/- 6mm The nominal thickness of the remainder of section 03 and section 60 was increased to 85mm For the remaining sections 61, 62 and 02A, the Contractor did spot checks and the nominal thicknesses were reduced to 78mm.

The depth of the surface course pavement in the sampling areas of section 02 was of concern because several cores would be taken for special tests and the thickness might not be adequate. At a site meeting on June 17, 1997, the Contractor was placed on notice that spot cores would be taken outside the monitoring area and if the core thicknesses were inadequate, that another sampling area would have to be constructed On the last day of paving section 62, the Contractor requested permission to construct the last transition area 10+125 - 9+883 with the Superpave 12 5mm mix in case the sampling area of section 02 was found to be inadequate This request was approved One core taken at section 02, 0-02m 13+212 showed 65mm and 2 cores at 152+02 showed 60mm thickness, both being within the specification requirements.

The nuclear densities ere taken by Kelly Dechert, Smith Construction with a nuclear gauge by Humbolt Scientific Inc. Serial No. 2033 A correction factor of +1.5% was added to the compaction results obtained.

Sampling and Testing

Each test section was divided into lots for sampling and testing purposes:

Lot 1 - From start of test section to start of Long Term sampling area (transition area)

Lot 2 - Monitoring portion and Long Term sampling areas on either side

Lot 3 - Remaining portion to the end of the test section (transition area)

Lot 4 - The lane adjacent to Lots 1, 2 and 3 (EBL)

The contract documents stipulated the frequency of sampling and testing with specific mention of the location of sampling and testing of the monitoring portion of each test section to conform to the Materials Sampling and Testing Plan. The binder course sample locations were selected generally evenly by the Inspectors.

The nuclear densities of the base and the binder course were taken by DBA Engineering in 1996 with a nuclear gauge manufactured by Humbolt Scientific Inc., Model 5001P SN 264 The last major calibration was done on May 1, 1996 All of the binder course road samples were also taken by DBA and delivered to the DBA Laboratory located at the plant.

For the surface course, the Contractor carried out the sampling of the bituminous mixture on the road and delivered the samples to the DBA Laboratory as well as carrying out the nuclear density tests. The nuclear gauge was manufactured by Humbolt Scientific, Inc. Model 5001C SN 2033. The last calibration was made on March 7, 1997

The hot mix bituminous samples were obtained from material dropped on to the shoulder by the MTV, Photo 13. For the binder course, with the exception of section 02, 3 boxes of material were obtained at each sampling location, 1 box for Q C. by DBA, 1 box for QA by MTO and 1 box to be held in reserve if needed for reference purposes at MTO Laboratory in Downsview. For section 02, additional materials was taken with the intent of carrying out performance tests depending upon the costs involved by the Superpave Regional Test Center It was subsequently decided to drop these tests when the cost was determined

Twelve 6" dia x 12" high cylinder of the HMAC binder course were taken for the MRL as well as combined aggregate and asphalt cement samples (see Table 35)

The Materials Sampling and Testing Plan does not require the sampling and testing of the binder course except for section 02 and there were no Tracking Tables Samples similar to those locations for the surface course were taken of the binder course and the test results will be used in evaluating the performance of the pavement

The bituminous test results of the binder course shown in Tables 26 and 27 met the specification requirements but the Superpave mix was on the stony side but within the tolerance of +/-4% The gradation fell outside of the recommended restricted zone

The surface course sample boxes were prepared and distributed at pre-determined locations. Three boxes (each 20kg) of hot mix were obtained at each of the 2 locations for Lots 1, 3 and 4; one box for DBA, 1 box for Paterson and 1 box for MTO. For Lot 2, samples were obtained from 4 locations, 3 of which were in the monitoring portion Each location produced 2 samples. the distribution of boxes for testing at each location was as follows· 1 box DBA, 2 boxes

Paterson and 2 boxes MTO. For section 02, an additional 4 boxes were obtained for MTO to take care of materials required for Performance Tests.

The bituminous test results of the surface course shown in Table 28 for sections 01 and 62 met the specification requirements. The gradation for the Superpave Mix (Table 29) came slightly inside the recommended restricted zone at sieves 1.18 and 0.600mm. Also the % air voids and % VMA were a little low on some of the test sections.

POST CONSTRUCTION CORES

The location of the cores was established by the Contractor's Survey Party as shown on the Materials Sampling and Testing Plans. Cores for the MTO Laboratory and for the LTPP Contractors Laboratory (Law) were taken on June 19 and 20, 1997. The cores for the Superpave Regional Test Center (SRTC) were not taken but their core locations have been retained for future cores. Fifty-eight cores were taken typical to those shown in Photo 14.

The Contractor supplied the drilling equipment. The I.D. of the core barrel was 155mm (6.1"). The drill was mounted on a 1/2T truck and it was difficult to maintain the specimen perpendicular to the vertical axis by more than 0 5 of a degree (1.6mm in 150mm) even with an improvised guide. Because the cores were being used primarily for examination and composition analysis or will be reduced to 100mm diameter cores from the 155mm cores, the off tolerance was considered to be acceptable.

Sample Data Sheet 2. Pavement Core Log at C-Type Locations was completed and the core thicknesses are shown in Table 36. All of the cores were delivered to the MTO Downsview Laboratory on July 3, 1997

ANALYSIS OF BINDER COURSE CONSTRUCTION DATA AND WINTER PERFORMANCE

An internal MTO meeting was held at the Port Hope District Office on April 28, 1997 to discuss the results of the binder course thicknesses, pavement performance, further design work of the surface course and the instrumentation. A Task Force meeting including ITX Stanley was held on May 5, 1997 at the MTO Downsview Office to review the general progress of the contract and to discuss several items of concern

Mr. Gerhardt Kennepohl made a presentation of the pavement performance. He indicated that the pavement was in reasonable good condition considering the unfavorable conditions in which it was laid. There was some stony spots which might be attributed to snow plowing or segregation of the aggregate and some local gouging which can be a result of pick-up during construction. There was also some roughness particularly at the joint areas. There was no longitudinal or transverse cracking. Low compaction was suspected because of the cold paving weather.

Mr. David Pearson displayed graphs to illustrate the thickness variation between the theoretical and actual grades of the top and bottom of the binder course. Messrs. Anil Virani and David Pearson led a general discussion on several concerns with proposed remedial action. They are as follows:

1) **Binder Course Thickness**. The binder course thickness exceeded the specification requirements of 65mm ± 6mm in sections 01, 02 and 03 (Table 31). Because the SPS-9A project is not a structural experiment (rather a mixture design for thermal cracking) it was decided that the Contractor would not be asked to reduce the pavement thickness by milling or to replace the binder course. The Contractor would be asked to obtain cores outside the monitoring area to verify the thickness of the 5 point levels.

2) **12.5mm Superpave Surface Course Mix Design**. The test results of the air voids were considered to be low Mr. Anil Virani will arrange for a comparison of the gyratory equipment used by MTO and DBA

3) **Density and Compaction**. Due to the poor weather conditions, it was considered that the compaction would be verified through cores.

4) **Roughness**. There were a few spots showing roughness and the roughness values should be known The Contractor should be asked to undertake a roughness survey of the binder course

The Contractor was notified of the above concerns and the following action was taken:

1) Cores were taken on May 16, 1997 Three cores were taken at locations 1m outside of each end of each test section (6 cores per section) with o/s of 0 9, 1 9 and 2 7m Some of the cores were used for thickness measurements or for density and compaction measurements. The core thickness are reasonably close to those measured by the 5 point levels, Table 37 Three cores taken before or after each monitoring section showed that the % compaction exceeded that obtained by the nuclear gauge in 1996, Table 37

2) A roughness measurement survey with the Profilometer was carried out by DBA on May 23, 1997 Sub-contractor American Safety Grooving and Grinding, Wauseon, Ohio with a CAT Diesel Paver GRD2 did grinding deemed necessary at 10 spots of the WBL varying in length from 6-50m for a total length of 244m All of the grinding was carried out in the transition areas except for 2 spots in the sampling areas.

⇒ Section 01 - 13+922 - 12+916 (-42 to -36)

⇒ Section 60 - 11+820 - 11+850 (0-0 to 0-30)

No grinding of the binder course was carried out in the monitoring sections

⇒ As a result of the meeting of May 15, 1997 between Mr. Anil Virani and DBA, the 12.5mm Superpave surface course mix was revised and a revised hot mix design report was issued on June 2, 1997. A 300T trial section was laid on June 5,1997.

CONSTRUCTION OF TEST SECTIONS - HIGHLIGHTS

Test Section 870901 - Station 13+880 - Station 13+728

⇒ Binder Course was laid on October 16, 1997

⇒ Surface Course was laid on June 9, 1997

The binder course consisted of the MTO Marshall HL4 mix design with 85/100 pen asphalt cement. The weather was partly cloudy and the temperature 8° C.

The fine grading kept 130m ahead of the paver and the 5 point levels about 100m ahead. The mixing temperature was 143° C, the laydown temperature 134° C and the nominal thickness 80mm, Table 32. The breakdown roller kept 15m behind the paver due to the tenderness of the mix. Only one 20T pneumatic tired roller was used. There was some pick-up at the start of paving but the pick-up disappeared at mid morning. The nuclear density test results retaken on October 31, 1996 showed 92.8% compaction, Table 33. The 5 point levels showed a compacted thickness of 79mm, Table 31.

The surface course consisting of the HL3 modified Marshall mix design with 85/100 pen asphalt cement was laid on June 9, 1997 The weather was sunny and warm with a temperature of 25° C.

The mixing temperature was 160° C, the laydown temperature 129° and the nominal pavement thickness 89mm, Table 34. There were no laying problems. The breakdown roller could roll right up to the paver. The intermediate 20T Dynapac roller kept up with the breakdown roller which was then followed by the final 30T Dynapac pneumatic roller Both rollers had tire pressures of 70 psi.

There was no pick-up with the intermediate pneumatic tire roller. Because of the pick-up trouble in 1996, the intermediate roller was equipped with a propane tank to heat the water before it was sprayed on to the tires. It was not working but it was not needed.

The nuclear density tests showed an average 96 6% compaction of MRD, Table 33 The 5 point levels showed an average thickness of 72mm, Table 31

The EBL of this test section was paved the same day as the WBL for both the binder and surface courses

Test Section 870902 - Station 13+210 - Station 13+1058

⇒ Binder Course was laid on October 24, 1996

⇒ Surface Course was laid on June 10, 1997

The binder course consisted of a 19mm Superpave mix with PG 58-40 asphalt cement with polymer

The Contractor was ready to pave at 8:00am on October 22, 1996. The paving equipment was in a position to start and the WBL was blocked off. The fine grading, 5 point levels and the density and moisture tests of the base had been completed when at noon it was discovered that the asphalt cement in the tank truck had stiffened and could not be pumped. The WBL was then re-opened to traffic. Both tank trucks were returned to the refinery. Since the forecast indicated that there was a 100% chance of rain for October 23, the paving was re-scheduled for October 24, 1996. In fact, it was cloudy but there was no rain on October 23.

On October 24, the equipment was ready to start paving at 8:00am but an oil spill elsewhere on the contract had to be repaired first which needed the grader. Paving of the WBL did not start until 11:00am at Sta. 13+470

The temperature at 11:00am was 8° C. It was cloudy at the beginning but as the day wore on, there was a drizzle and by the time the paver had reached the monitoring section there was continuous light rain.

The pulverized base was fine graded again and the 5 point levels retaken. Because of the wet surface and rain, the density and moisture tests were not retaken and the tests taken on October 22 were considered to be acceptable.

The mixing temperature was 150-160° C (300-320° F), the lay down temperature 138° C (280° F) and the nominal thickness 80mm, Table 32.

The breakdown roller stayed 15m behind the paver. The intermediate 20T roller kept 30m behind the breakdown roller and the final 30T Bros roller worked along with the intermediate roller with some overlap. Both pneumatic rollers were equipped with a cold soapy water solution spray bar.

Pick-up of the hot mix with the intermediate roller was a major problem. The pavement temperature had to cool to 60° C (140° F) to eliminate the pick-up As the day progressed, the intermediate rolling temperature was increased to 90° C (194° F) The final roller had no difficulty with pick-up following the intermediate roller

The infra-red thermometer did no produce consistent results because of the rain The rain and the spray produced a lot of steam Significant pick-ups were patched, Photo 8 In the after sample area, a lot of water had accumulated on the base ahead of the paver.

The 5 point levels showed an average thickness of 91mm, Table 31 and a average compaction 91%, Table 33 Twelve 6" dia. x 12" high cylinders of HMA were taken for the MRL as well as bulk samples in anticipation of carrying out performance tests similar to those taken for the surface course The performance tests were subsequently dropped when the cost to MTO was determined

The EBL had developed many pot holes, Photo 4, and while it was scheduled to be paved the same day, paving was postponed for safety reasons The EBL was paved the next day on October 25

The surface course consisting of 12.5mm Superpave mix with PG 58-40 asphalt cement with polymer was laid on June 10, 1997 The weather was hazy and hot with a temperature of 25° C.

The mixing temperature varied from 150-160° C (300-320° F), laydown temperature 118° C and the nominal thickness 78mm, Table 34. The intermediate roller, because of the pick-up could not

start until the pavement temerpaature had cooled to 65° C (149° F). As the day progressed, the intermediate rolling temperature was increased to 87° C (188° F). Because of the cooling off time, the hot mix needed for the intermediate roller, the distance between the paver (and the breakdown roller) and the intermediate roller kept increasing and had reached 200m. A spot check of the density at 13+100 (110m) showed 84% compaction. It was also noted that only 1 vibratory roller was operating. It was decided that the vibratory roller, with the dual operating drums, would go back as far as the intermediate roller 13+325 (225m). The pavement temperature at 13+325 was 65° C (149° F). It was noted that the breakdown roller recompacting at this low temperature created some isolated fine cracking near the center line. It was later discovered that the nuclear density gauge was malfunctioning and was subsequently repaired.

Hot mix samples were taken prior to reaching the monitoring section to find out if the temperature could be maintained for the 34 Gyratory compacted specimens. The hot mix samples were placed in an insulated box and taken to the DBA Laboratory but it was discovered that the temperature could not be maintained. This intended procedure was therefore dropped. The 34 Gyratory compacted specimens were prepared by reheating the specimens at the MTO Downsview Laboratory.

There was an overspill from the haul truck to the shuttlebuggy hopper between Sta. 13+147 - Sta. 13+142 (63-68m). Most of the hot mix material was shoveled off and the remainder had hardened and then flattened.

The nuclear density tests showed an average compaction of 94 5%, Table 33. The 5 point levels showed an average thickness of 59mm, Table 31.

The EBL was paved the same day The intermediate roller curved and stopped on the completed WBL. The intermediate roller started rolling when the pavement temperature was 85° C (185° F) and could roll within 75m of the paver

Test Section 870903 - Station 12+540 - Station 12+388

⇒ Binder Course was laid on October 28, 1996

⇒ Surface Course was laid on June 11, 1997

The binder course consisted of 19mm Superpave mix design with PG 58-34 asphalt cement. The weather was cloudy and windy and the temperature 10° C.

The higher than expected HMA tonnage was used on the previous 2 test sections, 01 and 02. The Contractor attributed the problem to the automatic grade control system The use of the automatic grade controls was discontinued on this test section and also on the remaining test sections. The laydown thickness followed the longitudinal grade

The mixing temperature was 160° C The laydown temperature varied from 140-150° C, with an average of 143° C, Table 32. While paving started at 8 30am at Sta 12+830, the intermediate roller could not start until 10 00am when the pavement temperature cooled to 60° C. This temperature was used as a guide for the intermediate roller for all of the test section.

The breakdown roller stayed 0-15m behind the paver and the intermediate roller 150-175m behind the breakdown roller (usually 1-1/2 hrs. behind). The nuclear test results showed an average of

90.9% compaction, Table 33. The 5 point levels showed a compacted thickness of 76mm, Table 31.

The seasonal instrumentation at Sta. 12+235 was connected by Mr. Ken Bannerman's assistant. The paving crew was held up 10 minutes while the connections were made.

The EBL binder course was paved the same day.

The surface course consisting of 12.5mm Superpave mix design with PG 58-34 asphalt cement was laid on June 11, 1997. The weather was hazy and hot with a temperature of 25° C.

The mixing temperature was 160° C, the laydown temperature varied from 135-140° C with an average of 137° C and the nominal thickness 85mm, Table 34. Paving started at 8:00am at Sta. 12+860 but the intermediate roller could not start until 9:15am, when the pavement temperature cooled to 70° C. This is the temperature that was used to control the intermediate roller compaction for the full test section.

The hot mix was tender and caused creases or ridges by the vibratory roller. These ridges if not flattened, tended to caused pick-up by the intermediate roller. A 10T Galion dual steel-wheeled finishing roller was brought in to flatten the ridges behind the breakdown roller. The breakdown roller stayed up to 100m behind the paver, and the intermediate roller 200m behind. Typical pick-up by the intermediate roller and the repair method by wheel barrow and patching is shown in Photos 7 and 8.

When the paver had reached Sta. 12+600 (0-60), the 5 point level results became available and it was noted that the thickness of section 02 was low even though it met the specification lower limits. The nominal thickness which had been 78mm was raised to 85mm. The Contractor then started to spot check the nominal and compacted thicknesses with his own survey crew, Photo 4. The paving of the WBL was carried 66m beyond the initial Materials Sampling and Testing Plan (to Sta 12+600)

The nuclear density test results showed an average compaction of 94 2%, Table 33 The 5 point levels showed an average thickness of 67mm, Table 31.

The seasonal probe installed at Sta. 13+325 in the binder course was exposed and the temperature probes were positioned in the surface course.

A grader was on hand, as it was on all test sections to bank and compact the shoulder materials up against the uncompacted hot mix to minimize lateral spreading out through compaction, Photo 11.

The EBL was paved the same day ending at Sta. 12+190 and about 65m short of Sta. 12+126 shown on the Materials Sampling and Testing Plan

Test Section 870960 - Station 11+820 - Station 11+668

⇒ Binder Course was laid on October 29, 1996

⇒ Surface Course was laid on June 12, 1997

The binder course consisted of 19mm Superpave gradation with PG 58-28 asphalt cement with polymer. The weather was sunny and the temperature was 9° C.

Fine grading of the base started at 7:00am. It was slow because several cross-fall corrections were required. The pulverized base was very hard and water was added to soften it. The first HMA truck arrived at 7:00am and paving started at 7.15am at Sta. 11+896. The paver caught up with the fine grading at Sta. 11+875 and stopped one hour for the fine grading and the 5 point levels to move ahead. There were 2 truck loads of HMA in the MTV and 6 trucks were lined up when paving resumed. The nuclear density and moisture were taken before fine grading.

There was an overspill of HMA from the truck into the MTV hopper at Sta. 11+840. The paver stopped at Sta. 11+845, moved ahead and leveled the spill, then returned over the fresh HMA from Sta. 11+845 - Sta. 11+850 (0-25 to 0-30). The paver could not get enough traction to move ahead over the fresh HMA so it was pulled by the MTV. This spill is located in the sample area from which cores will be taken; T=F (0-12 to 0-20) and T=E (0-25 to -30). The mixing temperature was 152° C. Following the 1 hour delay and just before reaching the monitoring portion, the laydown temperature was 115° C. The average laydown temperature through the monitoring portion was 132° C and the nominal laydown thickness was 75mm, Table 32. There was another stop of 15 minutes outside the monitoring section at Sta. 11+650 waiting for trucks.

The vibratory roller was generally 15m behind the paver. The 30T Bros. roller became the intermediate roller and the 20T Dynapac the final roller for the section. Pick-up did not occur when the pavement temperature was below 90° C (190° F).

The nuclear density test results showed an average of 94 2% compaction. The 5 point levels showed an average thickness of 63mm.

The binder course of the WBL stopped at Sta. 11+415 instead of Sta. 11+375 in order to pave the EBL before the rain. Heavy rain did come in late afternoon but the EBL had been completed to Sta. 11+425

The surface course consisting of 12.5mm Superpave mix with PG 58-28 asphalt cement with polymer was laid on June 12, 1997. The weather was hazy and hot and the temperature was 22° C.

The mixing temperature was 150° C, the average laydown temperature, 122° C and the nominal laydown thickness, 78mm. The breakdown roller held back about 50m behind the paver and usually started rolling when the pavement temperature was about 105° C. The intermediate roller was about 50m behind the breakdown roller The pavement had cooled to about 90° C (194° F) and there was no pick-up The final roller overlapped with the intermediate roller The Galion finishing roller used behind the breakdown rollers on the previous test section was not required.

The nuclear density test results showed an average compaction of 94 3% The 5 point levels showed an average thickness of 67mm.

The EBL was paved the same day

Test Section 870961 - Station 11+122 - Station 10+970

⇒ Binder Course was laid on October 31, 1996

⇒ Surface Course was laid on June 16, 1997

The binder course consisted of 19mm Superpave design with PG 58-34 asphalt cement with no polymer. The weather was cold with snow flurries and the temperature was 0° C.

Paving started at 8:30am at Sta. 11+375. The MTV plugged up at Sta. 11+325 and was held up for 35 minutes and 6 trucks were lined up. The test section Sta. 11+122 (0+00) was reached at 10:35am.

Fine grading was slow because of correction to the cross fall. After 3 lines, the 5 point level surveyors had to wait for the cross fall corrections to be made. It was non stop paving through the monitoring section.

The mixing temperature was 150° C, the average laydown temperature, 131 and the nominal pavement thickness 78mm, Table 32. The breakdown vibratory roller waited for a longer run to avoid many stops and started rolling when the pavement temperature was 100° C. The intermediate roller was right behind the breakdown roller and worked in the temperature range of 85-110° C with a tire pressure of 100 psi. The final roller with a tire pressure of 95 psi rolled when the pavement temperature was less than 70° C. The soapy water spray was not used except for a few meters at the beginning of the day and was not needed. There was no pick-up. Both the intermediate and final roller worked non stop.

The nuclear density test results showed an average compaction of 92.8%. The 5 point levels showed an average compacted thickness of 63mm, Table 31.

The surface course consisting of 12.5mm Superpave design with PG 58-34 asphalt cement with no polymer was laid on June 16, 1997 The weather was hazy and breezy and the temperature was 18° C.

The mixing temperature was 150° C, the average laydown temperature 118° C and the average nominal thickness of 78mm, Table 34

The paving of this test section went smoothly The vibratory breakdown roller held back (up to 50m) to get a good run in order to obtain smoothness The intermediate roller worked right up to the breakdown roller and also had some overlap with the final roller. There was a 5 minute stop waiting for trucks at Sta. 11+080 (142m). There were also 2 small spills from the truck to the shuttle buggy hopper at Sta. 11+65 (57m) and Sta 10+962 (160m) which were cleaned up on the run. The paver stopped at Sta. 10+850 for 10 minutes, in the transition area to repair the shuttle buggy. No tack coat was placed between Sta. 10+735 - 10+710.

The nuclear density test results showed an average of 93 5%, Table 33. The 5 point levels showed an average compacted thickness of 64mm, Table 31.

The paving of the EBL started at 1 00pm at Sta. 11+425 under threatening rain conditions. Paving stopped at 4·00pm, Sta. 10+870 when the heavy rains came. The Contractor had hoped to reached Sta. 10+700.

Test Section 870962 - Station 10+440 - Station 10+288

⇒ Binder Course was laid on November 1, 1996

⇒ Surface Course was laid on June 17, 1997

The binder course consisted of HL4 Marshall design with PG 58-40 asphalt cement with polymer. The weather was cold with snow flurries and the temperature was -2° C.

The equipment was all set to start paving at 7 00am. Snow during the night covered the pulverized base after a crust of frost had formed which made fine grading very difficult. A pulverizer was brought in but no operator was available. An operator arrived at 9:30am and fine grading started at 10:30am, Photo 2. There were snow flurries when the fine grading started and the snow melted when it hit the ground. By mid-afternoon, enough snow had melted to produce a slushy surface which had to be cleared off and replaced with granular from Sta. 10+100 - 8+885.

Paving started at Sta. 10+700 at 11:40am. The paver was usually about 100m behind the fine grading. There was no stopping of the paving operation within the test section but it was slowed down so that the 5 point levels and the density and moisture tests could be taken, Photos 5 and 6.

The mixing temperature varied from 160-170° C (average 165), the laydown temperature from 122-144° C. (average 132) and the nominal pavement thickness of 78mm.

Initially the hot mix had to cool to 60° C to avoid pick-up with the intermediate 20T roller or about 50-75m behind the paver. As the day progressed, the intermediate rolling temperature was increased to 90° C except that if the pavement became too wet due to the snowflurries, the pavement rolling temperature dropped to 70° C. The gap between the paver and the intermediate roller was 35m when the mix temperature was 90° C and 15m when pavement temperature was 70° C

Seasonal instrumentation and temporary temperature probes were installed by Mr. Ken Bannerman at Sta. 10+025, Photo 10

The nuclear density test results showed 92.6% compaction, Table 33 The 5 point levels showed an average compacted thickness of 65mm, Table 31

The paving of the WBL was completed in the dark at 6 30pm and the paving train moved to the EBL The EBL had developed many pot holes which were filled with water (Photo 4) and had become rough The EBL was slightly pulverized prior to fine grading Paving was completed by 2.00am, November 2, 1996.

The surface course consisting of HL3 modified Marshall design with PG 58-40 asphalt cement with polymer, was laid on June 17, 1997 The weather was sunny with some clouds and slight wind and the temperature was 10° C

Paving started at 6·45am at Sta 10+710 By 8 25am the paver reached Sta 10+475 (0-35m) and stopped to build up hot mix reserve so no stopping would take place in the monitoring section. The hot mix plant broke down at the same time which took 50 minutes to repair. The pavement between Sta 10+475 and Sta. 10+440 (0+00) is in the sample area and the pavement could have been cooler than the rest of the pavement when compacted.

The mixing temperature was 160° C, the average laydown temperature 117° C and the nominal placement thickness 79mm, Table 34. The breakdown roller could roll right up to the paver but it usually held back 50m when the hot mix temperature was 90-100° C to get a good run. The breakdown roller created ridges and a 9T Galion dual wheeled steel roller was used ahead of the intermediate roller. Even with the soapy spray, the hot mix had to cool to 70° C to avoid pick-up with the pneumatic roller. The 30T final roller kept 100m behind the intermediate roller with some overlap. The final roller did not start rolling until the pavement temperature was 38° C.

The paving of the WBL stopped at Sta. 10+150 (instead of 9+885) so that the paver could be available to fix up the tank crossing at Sta. 9+885 before paving the EBL. Without the paver in front, the intermediate roller could stop on an existing pavement beyond Sta. 10+150. For the last 150m, the intermediate rolling temperature was 77° C.

The nuclear density test results showed an average of 94.3% compaction, Table 33. The 5 point levels showed an average compacted thickness of 69mm, Table 31.

The EBL was paved the same day ending at Sta. 10+140.

The paving of the WBL stopped at Sta. 10+150, 327m short of the Materials Sampling and Testing Plan on June 17. The Contractor had been previously advised that if the compacted pavement thickness of 870902 was inadequate, a replacement sample area might be required. The Contractor requested to complete the WBL, all in the transition area with the same mix as 870902 namely the Superpave design with PG 58-40 with polymer. This extension while in 870962 was called 870902A.

Test Section 870902A - Station 10+150 - Station 9+885

⇒ Binder Course was laid on November 1, 1996 - see 870962

⇒ Surface Course was laid on June 18, 1997

The surface course consisted of 12.5mm Superpave design with PG 58-40 with polymer. The weather was sunny with some clouds and the temperature was 11° C.

The application of the SS1 tack coat on all previous test sections was controlled by the speed of the distributor. The replacement distributor for this test section had no speed control and the application was quite heavy, Photo 12.

The mixing temperature was 158° C. The laydown temperature 120° C (varied from 113-132). The lower laydown temperature resulted from trucks waiting up to 90 minutes for the 5 point levels to be taken. These levels were taken at 25m intervals by the Contractor's crew and not the Sub-contractor, Janota Patrick's Assoc.

The breakdown roller could work right up to the paver but usually held back up to 50m to get a good run when the pavement temperature was 90-100° C. The Galion steel wheeled finishing roller was used to flatten the ridges left by the vibratory roller. The pavement temperature had to cool to 60° C before pick-up could be avoided by the intermediate roller. The propane tank on the intermediate roller was not functioning and only cold soapy water was used in the spray bar.

The nuclear density test results showed an average compaction of 94 6%

Paving of the EBL was ready to start at 1:00pm on June 18 at Sta. 10+140. Three truck loads of hot mix were in place. Because of a heavy rain storm, paving was abandoned until June 19 at which time MTO considered it to be the last working day.

DEVIATIONS FROM GUIDELINES

1) The Experiment Design and Research Plan for Experiment SPS-9A Superpave Asphalt Binder Study requires a surface course thickness not less than 65mm. The Construction Guidelines show the as compacted thickness of the asphalt concrete layer (surface plus binder course) in any test section shall be constructed within + or -6mm of the average value of the other test sections in the project. The MTO specification in the contract shows a requirement of 65mm ± 6mm for both the binder and surface courses.

The average thickness value for the combined surface and binder courses for all of the test sections is 139mm (binder 73mm, surface 66mm). On the basis of the ± 6mm tolerance, the following test sections fall outside of this requirement: 01 (151mm), 02 (150mm), 60 (130mm), and 61 (127mm). The following surface course test sections fall outside the minimum 65mm requirements: 02 (59mm) and 61 (64mm).

As for the MTO specification thickness of 65mm ± 6mm the following sections are above the tolerance limits for the binder course: 01 (79mm), 02 (91mm) and 03 (76mm). For the surface course section 01 with 72mm the thickness is slightly above the tolerance limit and the rest of the test sections are within the tolerance levels. An SPS project deviation report is at Appendix D.

2) The profilograph measurements were obtained with a California-type profilograph. The profile index was obtained for each subset (100mm) with a zero blanking band instead of 0.1 km with a 5mm wide blanking band as recommended in the Construction Guidelines. However, the profile indices were adjusted to cover the roughness measurements of the monitoring portion of each test section. (Construction Data Sheet 14, Plant-Mixed Asphalt Bound Layers Density and Profile Data)

The Profile Index for a 5mm blanking band was estimated by comparing the data obtained for the 0mm and 5mm blanking band graph developed by MTO, Figure 12. The comparison is as follows:

Test Section	Profile Index	
	0mm Blanking Band	Estimated 5mm Blanking Band
01	436	100
02	366	73
03	456	110
60	344	68
61	370	75
62	330	65

MTO specifications for this project provided a payment factor of 1.00 for profile indices of 200-450 but for the 1996 construction season, the payment factor or 1.00 also applied to profile indices of 451-600. The target of less than 160mm per km as shown in the Guidelines for the 5mm blanking band had been met in all of the test sections.

SUMMARY

This FHWA-LTPP Project was part of MTO Contractor 96-25. It contained 3 SPS-9A test sections and 3 supplemental test sections. The contract had 55 working days.

The project involved milling the existing pavement, then placing a 65mm binder course and a 65mm surface course with a partially paved shoulder. The milling was completed on September 19, 1996. The binder course placement started on October 16, 1996 and was completed on November 1, 1996. The 55 calendar working days ended on October 25, 1996, but the weather was too unpredictable to place the surface course. The surface course was placed in June 1997.

The Contractor started the binder course paving with automatic grade controls. After placing sections 01 and 02, it was discovered that the thicknesses of the binder exceeded the specification requirements of 65mm ± 6mm. The automatic grade controls were disconnected and the paver followed the contours of the base.

The main problem with the binder course was the compaction of the PG asphalt cement mixes. They were sticky. While the breakdown roller could work right up to the paver, the intermediate roller had to wait until the pavement temperature had cooled to 60° C to avoid pick-up. Spraying of a soapy water solution on the front tires did not seem to help very much because the water was cold. The pick-up temperature was determined by having someone in front of the roller checking the pavement temperature and someone behind checking the pick-ups.

The pulverized base was exposed to traffic from 32-47 days requiring continuous maintenance. The Contractor was generally successful in completing the WB and EB lanes for each section in one day. During the paving operation, traffic control restricted the 2-way traffic to one lane.

The paving of the surface course was carried out from June 9-18, 1997 There was some problem with the thickness for section 02, when the 5 point levels showed a low borderline thickness. On subsequent sections, the Contractor carried out his own spot checks for the compacted thicknesses and adjusted the nominal laydown thicknesses as required

The Contractor installed a propane tank to heat the soap water spray This allowed the pneumatic roller to start rolling at 70° C instead of 60° C. The same grade of asphalt cement was used in the binder and surface courses.

All of the binder course mixes met the specification requirements. The Superpave binder course gradation fell outside the restricted zone but the mix was on the coarse side. The gradation of the Superpave surface course mix fell slightly within the recommended restricted zone on 2 sieve sizes and the % air voids and % VMA were low in some of the test sections.

This was an End Result Specification Contract involving bonuses and penalties. The Contractor prepared mix designs and carried out the quality control functions. Several construction problems were encountered mostly related to the compaction of the Superpave mixes because of their stickiness with which they had no previous experience. The Contractor tried very hard to overcome all the problems and to obtain the results expected. All of the Contractor's staff (and the Sub-contractors) were cooperative and helpful and recognized the special needs of this research project.

MTO people involved with the preparation of the contract documents related to the SPS-9A project from the Regional, Engineering Materials and Research Office closely followed the construction operations and provided information as required. In 1996, and for the laying of the binder course, MTO had a Field Laboratory for QA testing. This Field Laboratory was sold and the bulk bituminous surface course samples were tested at 2 Laboratories. The gradation and extraction tests were done by Paterson in Ottawa, and the volumetric tests at the MTO Laboratory in Downsview The QA test results were not available during the course of construction.

Overall, it can be stated that all of the information (samples and field tests) required for the evaluation of the long-term pavement performance were obtained. Some of the paving conditions, particularly the binder course, were unfavorable but they did not seem to have any adverse affects on the field test results

TABLES

A, B, 1-37

TABLE A

Ontario SPS-9A, Project 870900, Hwy 17 WB, Petawawa, ON
Location, Method of Design and Type of Binder

Test Section	Limits	Method of Mix Design	Binder Course Mix	Surface Course Mix	Binder Type
01	Sta. 13+470 to 14+135	Marshall	HL4	HL3 Mod	85/100 Pen
02	Sta. 12+800 to 13+470	Superpave	19mm	12.5mm	PG 58-40
03	Sta. 12+100 to 12+800	Superpave	19mm	12.5mm	PG 58-34
60	Sta. 11+375 to 12+100	Superpave	19mm	12.5mm	PG 58-28
61	Sta. 10+700 to 11+375	Superpave	19mm	12.5mm	PG 58-34 No Polymer
62	Sta. 9+885 to 10+700	Marshall	HL4	HL3 Mod	PG 58-40

TABLE B

Ontario SPS-9A, Project 870900, Hwy 17 WB, Petawawa, ON
Superpave Aggregate Gradation Requirements
(Table C of the Contract Documents)

Sieve Designation	Percent Passing Criteria (Control Points)	
	Normal Maximum Sieve Size	
(mm)	12.5mm	19.0mm
25.0		100.0
12.5	90.0 - 100.0	
2.36	28.0 - 58.0	23.0 - 49.0
19.0	100.0	90.0 - 100.0
0.075	2.0 - 10.0	2.0 - 8.0
Sieve	***Recommended Restricted Zone***	
2.36	39.1	34.6
1.18	25.6 - 31.6	22.3 - 28.3
0.600	19.1 - 23.1	16.7 - 20.7
0.300	15.5	13.7

TABLE 1
Ontario SPS-9A, Project 870900, Hwy 17 WB, Petawawa, ON
Pavement Structure

Layer No.	Project Layer Code	Layer Thickness mm	Material Code	Material Description/Comments	Depth to Rock m
1	A	---	204	Subgrade - Poorly Graded Sand	
2	B	varies	253	Subbase - Sandy Gravel	
3	C	200	319	Base - Pulverized existing AC pavement mixed with underlying granular	
4	D	65	01	Binder Course - HMAC, 19mm Max. Size	
5	E	65	01	Surface Course - HMAC, 12.5mm Max. Size	

TABLE 2
Ontario SPS-9A PROJECT 870900, HIGHWAY 17 WB, PETAWAWA, ON
Agency Field Testing

Field Tests	Test	No. of Tests	Test Location (Identifier)
Pre-Construction			**Monitoring**
Depth to Rigid Layer	shoulder auger probe to 6m or refusal	1 per section	Sta 0+076 at edge of shoulder (S01AXX)
Recompacted Pulverized AC Surface			
Nuclear Density Tests	AASHTO T238-86 backscatter	3 per section	Sta 0+030, 0+076, and 0+122, 1m from pavement edge (T01AXX-T03AXX)
Establish TBM's and Baseline Levels	rod and level	55 per section	5 transverse locations (pavement edges, mid-lane, wheel tracks) at 15m intervals
Post-Construction			
Nuclear Density Tests Binder and Surface	AASHTO T238-86 backscatter	3 per section per layer	Sta 0+030, 0+076, and 0+122, 1m from pavement edge (T04AXX-T09AXX)
Finished Surface Levels and on Top of Intermediate Layers where Desired	rod and level	55 per section	Above points located in baseline survey

Note: XX Last two digits of location identifiers is the section number (01, 02, 03, 60, 61, and 62)
Stationing is in metres

TABLE 2A
Ontario SPS-9A, Project 870900, HWY 17 WB, PETAWAWA, ON
Agency Field Sampling

PRE-CONSTRUCTION

Section	Description	Sample Numbers
870901	pulverized base samples subgrade samples	BG01A01, MG01A01 BS01A01, MS01A01
870902	pulverized base samples subgrade samples	BG01A02 (Agency & MRL), MG01A02 BS01A02, MS01A02
870903	pulverized base samples granular subbase samples subgrade samples	BG01A03, MG01A03 BG02A03, MG02A03 BS01A03, MS01A03
870960	pulverized base samples subgrade samples	BG01A60, MG01A60 BS01A60, MS01A60
870961	pulverized base samples subgrade samples	BG01A61, MG01A61 BS01A61, MS01A61
870962	pulverized base samples subgrade samples	BG01A62, MG01A62 BS01A62, MS01A62

TABLE 2A (Cont.)
Ontario SPS-9A, Project 870900, HWY 17 WB, PETAWAWA, ON
Agency Field Sampling

DURING-CONSTRUCTION

Section	Description	Sample Numbers
870901	2-19 litre pails of 85-100 pen. AC 5-19 litre pails of 6-split-off GC samples of surface course HMAC	BC01A01 (Agency & MRL) BA01A01-BA06A01 (Agency QC/QA)
870902	2-19 litre pails of PG 58-40 5-19 litre pails of combined aggregate - Superpave surface course mix 34-split-off GC samples of surface course mix 6-split-off GC samples of binder course mix 12-6"dia. x 12" cylindrical molds filled with binder course hot mix	BC01A02 (Agency & MRL) BU01A02 (MRL) BA01A02-BA34A02 (Agency GC Specimen) BA52A02-BA54A02. BA81A02-BA83A02 (Agency QC/QA) BA50A02 (MRL)
870903	2-19 litre pails of PG 58-34 6-split-off GC samples of surface course mix	BC01A03 (Agency & MRL) BA01A03-BA06A03 (Agency QC/QA)
870960	2-19 litre pails of PG 58-28 6-split-off GC samples of surface course mix	BC01A60 (Agency & MRL) BA01A60-BA06A60 (Agency QC/QA)
870961	2-19 litre pails of PG 58-34 (polymer modified) 6-split-off GC samples of surface course mix	BC01A61 (Agency & MRL) BA01A61-BA06A61 (Agency QC/QA)
870962	combined aggregate 6-split-off GC samples of surface course mix	BU01A62 (MRL) BA01A62-BA06A62 (Agency QC/QA)

TABLE 2A (Cont.)
Ontario SPS-9A, Project 870900, HWY 17 WB, PETAWAWA, ON
Agency Field Sampling, Cores

POST-CONSTRUCTION

Section	Description	A=0 Months	B=6 Months	C=12 Months	D=18 Months	E=24 Months	F=48 Months
870901	152mm dia cores	CA01A01-CA08A01	CA01B01-CA08B01	CA01C01-CA08C01	CA01D01-CA08D01	CA01E01-CA08E01	CA01F01-CA08F01
870902	152mm dia cores	CA01A02-CA34A02 *SEE NOTE*	CA01B02-CA08B02	CA01C02-CA08C02	CA01D02-CA08D02	CA01E02-CA08E02	CA01F02-CA08I 02
870903	152mm dia cores	CA01A03-CA08A03	CA01B03-CA08B03	CA01C03-CA08C03	CA01D03-CA08D03	CA01E03-CA08E03	CA01F03-CA08F03
870960	152mm dia cores	CA01A60-CA08A60	CA01B60-CA08B60	CA01C60-CA08C60	CA01D60-CA08D60	CA01E60-CA08E60	CA01F60-CA08F60
870961	152mm dia cores	CA01A61-CA08A61	CA01B61-CA08B61	CA01C61-CA08C61	CA01D61-CA08D61	CA01E61-CA08E61	CA01F61-CA08F61
870962	152mm dia cores	CA01A62-CA08A62	CA01B62-CA08B62	CA01C62-CA08C62	CA01D62-CA08D62	CA01E62-CA08E62	CA01F62-CA08F62

NOTE: Do not take cores 01, 04, 08, 09, 10, 12, 13, 17, 18, 20, 22, 26, 27, 29, 30 34 until advised

TABLE 3
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Agency Laboratory Testing Summary

Laboratory Test	LTPP Test	LTPP Protocol	Number of Tests	Source of Material
EXISTING PAVEMENT				
Subgrade				**10 kg. Bulk Samples and Jar Samples**
Sieve Analysis	SS01	P51	6	BS01A01, BS01A02, BS01A03, BS01A60, BS01A61, BS01A62
Atterberg Limits	SS03	P43	6	BS01A01, BS01A02, BS01A03, BS01A60, BS01A61, BS01A62
Classification	SS04	P52	6	BS01A01, BS01A02, BS01A03, BS01A60, BS01A61, BS01A62
Natural Moisture Content	SS09	P49	6	MS01A01, MS01A02, MS01A03, MS01A60, MS01A61, MS01A62
Unbound Subbase and Pulverised AC Base				**25 kg. Bulk Samples**
Particle Size Analysis	UG01	P41	7	BG01A01, BG01A02, BG01A03, BG02A03 BG01A60,BG01A61, BG01A62
Sieve Analysis (washed)	UG02	P41	7	BG01A01, BG01A02, BG01A03, BG02A03 BG01A60,BG01A61, BG01A62
Atterberg Limits	UG04	P43	7	BG01A01, BG01A02, BG01A03, BG02A03 BG01A60,BG01A61, BG01A62
Classification	UG08	P47	7	BG01A01, BG01A02, BG01A03, BG02A03 BG01A60,BG01A61, BG01A62
Natural Moisture Content	UG10	P49	7	MG01A01, MG01A02, MG01A03, MG02A03 MG01A60,MG01A61, MG01A62

TABLE 4
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Agency Laboratory Tests on Mix Components

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests	Source of Material				
Aggregates				**Marshall Aggregates**	**Superpave Aggregates**			
Combined Aggregate Gradation	AG04	P14	2	BU01A62	BU01A02			
Specific Gravity of Co Agg	AG01	P11	2	BU01A62	BU01A02			
Specific Gravity of Fine Agg	AG02	P12	2	BU01A62	BU01A02			
Specific Gravity of Pass 200		AASHTO T100	2	BU01A62	BU01A02			
Coarse Agg Angularity		PA DOT TM621	2	BU01A62	BU01A02			
Fine Agg Angularity		ASTM C1252	2	BU01A62	BU01A02			
Toughness		AASHTO T96	2	BU01A62	BU01A02			
Soundness		AASHTO T104	2	BU01A62	BU01A02			
Deleterious Material		AASHTO T112	2	BU01A62	BU01A02			
Clay Content		AASHTO T176	2	BU01A62	BU01A02			
Thin, Elongated Particles		ASTM D4791	2	BU01A62	BU01A02			
Asphalt Cement*				**85-100 Penetration Grade**	**PG58-40**	**PG58-34 Modified**	**PG58-34**	**PG58-28**
Penetration @ 5 deg C		AASHTO T49	5**	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Penetration @ 25 deg , 46 deg C	AE02	P22	10**	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Viscosity @ 60 deg , 135 deg C	AE05	P25	20	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Specific Gravity @ 16 deg C	AE03	P23	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Dynamic Shear @ 3 Temps		AASHTO TP5	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Brookfield Viscosity 135 deg , 165 deg C		ASTM D4402	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Rolling Thin Film (RTFOT)*		AASHTO T240	Note	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Dynamic Shear on RTFOT Residue @ 3 Temps *		AASHTO TP5	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Pressure Aging (PAV) of RTFOT Residue*		AASHTO PP1	Note	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Creep Stiffness of PAV Residue (2 Temps) - 24h Conditioning*		AASHTO TP1	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Creep Stiffness of PAV Residue (2 Temps)*		AASHTO TP1	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Dynamic Shear on PAV Residue (3 Temps)*		AASHTO TP5	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60
Direct Tension on PAV Residue (2 Temps)*		AASHTO TP3	10	BC01A01	BC01A02	BC01A61	BC01A03	BC01A60

* Consult SPS-9A Sampling & Testing Guidelines, February 1996 for Quantities and Temperatures

** Three penetration readings are required from each test

Note: Sufficient material should be conditioned for the required tests

TABLE 5
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Level 1 Mix Design Testing for MTO and Superpave Alternative Laboratory Prepared Mixes

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests	Source of Material (Specimen)
Gyratory Compac[illegible] t Specimen for Sections 870901, 870903, 870960, 870961, and 870962				
@ Design % AC and N_{Max} % AC Wearing Course (12 5mm max)		AASHTO TP4	3	NA01AXX-NA03AXX (LA01AXX-LA03AXX)
@ Design % AC and 7% Air Voids % AC Wearing Course (12 5mm max)		AASHTO TP4	6	NA04AXX-NA09AXX (LA04AXX-LA09AXX)
Moisture Susceptibility	AC05	P05	1	LA04AXX-LA09AXX
Bulk Specific Gravity	AC02	P02	9	LA01AXX-LA09AXX
Maximum Specific Gravity	AC03	P03	1	NA03AXX
Volumetrics (calculations)*				
Volume Percent of Air Voids		AASHTO PP19	3	LA01AXX-LA03AXX
Percent Voids in Mineral Aggregate		AASHTO PP19	3	LA01AXX-LA03AXX
Voids Filled with Asphalt		AASHTO PP19	3	LA01AXX-LA03AXX

Note 1) For Project 870900 N_{ini} – 7, N_{Design} - 86, N_{MAX} - 134

Note 2) Section 03, 60, and 61 use same aggregate gradation as in section 02, Superpave Mix Design but with alternative binders PG58-34, PG58-28, and Polymer modified PG 58-34 (Contractor/Supplier option) respectively.

Note 3) Section 62 uses same aggregate gradation as in the MOT design section 01, but with PG 58-40 Superpave binder

* Use estimated bulk specific gravity at N_{Design} from Density vs. Gyration curves @ N_{Max} in volumetric calculations

TABLE 5A
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Quality Control Field Laboratory Testing of Paver Samples other than Superpave AC Mixes

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests	Source of Material (Specimen)
Gyratory Compaction @ N_{Mix} (Paver Samples) 870900 N_{Mix} = 134		AASHTO TP4 115mm high specimen	6 per mix per test section	B01AXX-B06AXX (DA01AXX-DA06AXX)
Bulk Specific Gravity - G_{mb}	AC02	P02	6 per mix per test section	DA01AXX-DA06AXX
Asphalt Content (Extraction)	AC04	P04	2 per mix per test section	B01AXX, B06AXX
Aggregate Gradation (Extracted Aggregate)	AG04	P14	2 per mix per test section	B01AXX, B06AXX
Maximum Specific Gravity - G_{mm}	AC03	P03	2 per mix per test section	B01AXX, B06AXX
Volumetrics Volume Percent of Air Voids Percent Voids in Mineral Agg Voids Filled with Asphalt		 AASHTO PP19 AASHTO PP19 AASHTO PP19	6 per mix per test section	 DA01AXX-DA06AXX DA01AXX-DA06AXX DA01AXX-DA06AXX

Note: Gmb @ N_{Mix} ~98% Gmm XX - section numbers 01, 03, 60, 61, and 62

TABLE 6
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON - Section 870902
Superpave Level 3 Mix Testing, Agency Laboratory

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests	Source of Material (Specimen)
Gyratory Compactor @ N_{Max} (Lab Samples)		AASHTO TP4	6	NA01A02-NA06A02 (LA01A02-LA06A02)
Gyratory Compactor @ 3% AV (Lab Samples)		AASHTO TP4	2	NA07A02-NA08A02 (LA07A02-LA08A02)
Gyratory Compactor @ 7% AV (Lab Samples)		AASHTO TP4	32	NA09A02-NA40A02 (LA09A02-LA40A02)
Gyratory Compactor @ 3% AV (Field Samples)		AASHTO TP4	2	BA01A02, BA34A02 (DA01A02, DA34A02)
Gyratory Compactor @ 7% AV (Field Samples)		AASHTO TP4	26	BA05A02-BA30A02 (DA05A02-DA30A02)
Gyratory Compactor @ N_{Max} (Field Samples)		AASHTO TP4	6	BA02A02-BA04A02, BA31A02-BA33A02 (DA02A02-DA04A02, DA31A02-DA33A02)
Bulk Specific Gravity	AC02	P02	24	LA01A02-LA06A02, LA09A02-LA14A02, DA02A02-DA04A02, DA31A02-DA33A02, [LA07A02, LA15A02, LA38A02, DA06A02, DA16A02, DA22A02]
Asphalt Content (Extraction)	AC04	P04	3	BA05A02-BA06A02, BA34A02
Aggregate Gradation (Extracted Aggregate)	AG04	P14	3	BA05A02-BA06A02, BA34A02
Maximum Specific Gravity	AC03	P03	4	NA15A02, BA05A02, BA06A02, BA34A02
Moisture Susceptibility	AC05	P05	1	LA09A02-LA14A02
Volumetrics**				Same Specimen for all Volumetrics
Volume Percent of Air Voids		AASHTO PP19	12	LA01A02-LA06A02, DA02A02-DA04A02, DA31A02-DA33A02
Percent Voids in Mineral Aggregate		AASHTO PP19	12	Same
Voids Filled with Asphalt		AASHTO PP19	12	Same

[ ] These specimen are then included in the shipment with other gyratory compacted samples to the LTPP Contractor Laboratory PCS/Law Engineering, Atlanta, GA and the Superpave Regional Test Center
Note: For SRTC substitute Materials Reference Library

** The corrected bulk density at N_{Design} shall be estimated from the gyratory compaction curves, Density vs. Gyrations to N_{Max} for calculation of the volumetric properties

TABLE 7
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON - SECTION 870902
Superpave Level 3 Mix Testing, LTPP Contractor Laboratory

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests	Source of Material
Creep Compliance	AC06	P06	12	LA19A02-LA22A02 DA15A02, DA16A02, DA18A02, DA30A02 CA03A02, CA14A02, CA23A02, CA32A02
Indirect Tensile Strength	AC07	P07	12	LA15A02-LA18A02 DA05A02, DA09A02, DA17A02, DA29A02 CA07A02, CA16A02, CA21A02, CA31A02
Resilient Modulus	AC07	P07	3	LA16A02-LA18A02 DA09A02, DA17A02, DA29A02 CA16A02, CA21A02, CA31A02

Note: 100mm dia test specimen will be cored from the 152mm dia specimen and cores

TABLE 8

Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON - SECTION 870902

Superpave Level 3 Mix Testing, Superpave Regional Test Center *(for SRTC substitute MRL)*

Laboratory Test	LTPP Protocol	No. of Tests	Source of Material
Frequency Sweep at Constant Height	AASHTO M-003, P-005 **SST-1**	10	LA23A02-LA26A02 DA06A02, DA10A02, DA24A02, DA28A02 CA04A02, CA30A02
Simple Shear at Constant Height	AASHTO M-003, P-005 **SST-1**		
Uniaxial Strain	AASHTO M-003, P-005 **SST-2**	10	LA27A02-LA30A02 DA07A02, DA11A02, DA23A02, DA27A02 CA12A02, CA22A02
Volumetric Test	AASHTO M-003, P-005 **SST-2**		
Repeated Shear at Constant Stress Ratio	AASHTO M-003, P-005 **SST-3**	6	LA07A02, LA08A02 DA01A02, DA34A02 CA09A02, CA26A02
Indirect Tensile Creep Compliance	AASHTO M-005 **SP-IT**	30	LA31A02-LA40A02 DA08A02, DA12A02-DA14A02, DA19A02-DA22A02 DA25A02-DA26A02 CA01A02, CA08A02, CA10A02, CA13A02 CA17A02-CA18A02, CA20A02 CA27A02, CA29A02, CA34A02
Indirect Tensile Strength	AASHTO M-005 **SP-IT**		

Note: The Gyratory Compacted Specimens from Laboratory Prepared Mix (LA) and Plant Mix (DA) are to be sent to the MRL for storage until revised laboratory testing is finalized. CA cores for SRTC will not be taken at this time

TABLE 9
Bulk Material Samples to be Shipped to the LTPP Materials Reference Library (MRL) 1625 Crane Way, Sparks, NV, 89431 from Project 870900

Material	Number
Asphalt cement collected from the plant in 19-litre pails	1 for each type of binder
Combined coarse and fine aggregate obtained from the plant and stored in 19-litre pails	10 for each aggregate combination
HMAC binder course mix in 12-6" dia x 12" high cylinders	mount on plywood pallet approx. 350 lbs.
Pulverized base uncompacted sample in 19-litre pails	5

Notes:

The MRL will provide 19 litre containers and will pay for shipping costs

Contact the MRL @ (702) 358-7574 prior to construction to make arrangements for sample containers and to receive specific shipping instructions Contacts are Mr Jim Nichols/Rodney Soule or Mr Cal Berge

Only one sample of each unique asphalt binder used in the SPS-9A mixes is needed If the same binder is used in more than one mix then only one sample of that binder should be obtained

A copy of LTPP Field Operations Information Form 1 should be completed and attached to all MRL shipments A copy of the form should be mailed separately to the MRL. Mail other completed copy to Mr Alfred Lip at the LTPP Regional office. 415 Lawrence Bell Drive, Suite 3, Amherst NY, 14221 - telephone (716) 632-0804

See also Table 8

TABLE 10
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Agency Laboratory Tests on Cores Taken at Time A=O

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests/ Per Layer	Source of Material
Core Examination/Thickness	AC01	P01	58	All Cores
Bulk Specific Gravity	AC02	P02	48	CA02A02, CA06A02, CA11A02, CA15A02 CA19A02, CA24A02, CA28A02, CA33A02 and All A Cores from Sections 01, 03, 60, 61, 62
Max Specific Gravity	AC03	P03	12	CA11A02, CA24A02, CA01AXX, CA08AXX
Asphalt Content (Extraction)	AC04	P04	48	CA02A02, CA06A02, CA11A02, CA15A02 CA19A02, CA24A02, CA28A02, CA33A02 and All A Cores from Sections 01, 03, 60, 61, 62
Aggregate Gradation (Extracted Agg.)	AG04	P14	12	CA11A02, CA24A02 and CA01AXX, CA08AXX
Volumetrics				
Volume Percent of Air Voids		AASHTO PP19	12	CA11A02, CA24A02 and CA01AXX, CA08AXX
Percent Voids in Mineral Aggregate		AASHTO PP19	12	CA11A02, CA24A02 and CA01AXX, CA08AXX
Voids Filled with Asphalt		AASHTO PP19	12	CA11A02, CA24A02 and CA01AXX, CA08AXX
Recovered Asphalt Cement				
Abson Recovery	AL01	P21	48	CA02A02, CA06A02, CA11A02, CA15A02 CA19A02, CA24A02, CA28A02, CA33A02 CA01AXX-CA08AXX
Penetration @ 5 deg C		AASHTO T49	6**	Combined Sample from Each Test Section
Penetration @ 25 deg C and 46 deg C	AE02	P22	12**	Combined Sample from Each Test Section
Viscosity @ 60 deg C and 135 deg C	AF05	P25	24	Combined Sample from Each Test Section
Specific Gravity @ 16 deg C	AL03	P23	12	Combined Sample from Each Test Section
Dynamic Shear @ 3 Temperatures***		AASHTO TP5	12	Combined Sample from Each Test Section
Creep Stiffness @ 2 Temperatures***		AASHTO TP1	12	Combined Sample from Each Test Section
Direct Tension @ 2 Temperatures***		AASHTO TP3	12	Combined Sample from Each Test Section

XX are for test sections 01, 03, 60, 61, and 62

* Cores CA01A02, CA04A02, CA08A02-CA10A02, CA12A02, CA15A02, CA17A02, CA18A02, CA20A02, CA22A02M CA26A02, CA27A02, CA29A02, CA30A02, CA34A02 are packaged and sent to the Superpave Regional Test Center (SRTC)

Cores CA03A02, CA07A02, CA14A02, CA16A02, CA21A02, CA23A02, CA31A02, CA32A02 are sent to the LTPP Contractor Laboratory (LCB)

** Three penetration readings are required for each test

*** The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading

TABLE 11

Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON

Post Construction Monitoring Tests on All Sections - Agency Laboratory Tests on Cores Taken at Time Intervals B Through F (6, 12, 18, 24, 48 Months)

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests/Per Layer	Source of Material
Core Examination/Thickness	AC01	P01	48 tests per time interval	All Cores from All Sections
Bulk Specific Gravity	AC02	P02	48	All Cores from All Sections
Maximum Specific Gravity	AC03	P03	12	CA01tXX, CA08tXX (All Sections)
Asphalt Content (Extraction)	AC04	P04	48	All Cores from All Sections
Aggregate Gradation (Extracted Agg)	AG04	P14	12	(CA01t01, CA08t01), (CA01t02, CA08t02), (CA01t03, CA08t03), (CA01t60, CA08t60) (CA01t61, CA08t61), (CA01t62, CA08t62)
Volumetrics				
Volume Percent of Air Voids		AASHTO PP19	12	CA01tXX, CA08tXX
Percent Voids in Mineral Aggregate		AASHTO PP19	12	CA01tXX, CA08tXX
Voids Filled with Asphalt		AASHTO PP19	12	CA01tXX, CA08tXX
Recovered Asphalt Cement				
Abson Recovery	AE01	P21	48	All Cores
Penetration @ 5 deg C		AASHTO T49	6**	Combined Recovered AC from Each Section
Penetration @ 25 deg C and 46 deg C	AE02	P22	12**	Combined Recovered AC from Each Section
Viscosity @ 60 deg C and 135 deg C	AE05	P25	24	Combined Recovered AC from Each Section
Specific Gravity @ 16 deg C	AE03	P23	12	Combined Recovered AC from Each Section
Dynamic Shear @ 3 Temperatures*		AASHTO TP5	12	Combined Recovered AC from Each Section
Creep Stiffness @ 2 Temperatures*		AASHTO TP1	12	Combined Recovered AC from Each Section
Direct Tension @ 2 Temperatures*		AASHTO TP3	12	Combined Recovered AC from Each Section

* The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading

** Three penetration readings are required from each test

TABLE 12
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Subgrade
Laboratory: Agency

Sample Location No	Constr. Sta.	Offset m	Sample No.	Lab Test No.	Description of Sample	Laboratory Handling & Test Sequencing					
						First	Second	Third	Fourth	Fifth	Sixth
Subgrade											
B01A01	13+713	1 5	BS01A01	2	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B01A02	13+043	1 5	BS01A02	2	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B01A03	12+373	1 5	BS01A03	2	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B01A60	11+653	1 5	BS01A60	2	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B01A61	10+955	1 5	BS01A61	2	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B01A62	10+273	1 5	BS01A62	2	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B01A01	13+713	1 5	MS01A01	2	Moisture Jar Sample	SS09/P49					
B01A02	13+043	1 5	MS01A02	2	Moisture Jar Sample	SS09/P49					
B01A03	12+373	1 5	MS01A03	2	Moisture Jar Sample	SS09/P49					
B01A60	11+653	1 5	MS01A60	2	Moisture Jar Sample	SS09/P49					
B01A61	10+955	1 5	MS01A61	2	Moisture Jar Sample	SS09/P49					
B01A62	10+273	1 5	MS01A62	2	Moisture Jar Sample	SS09/P49					

TABLE 13
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Base/Subbase
Laboratory: Agency

Sample Location No.	Constr. Sta.	Offset m	Sample No.	Lab Test No.	Description of Sample	Laboratory Handling & Test Sequencing					
						First	Second	Third	Fourth	Fifth	Sixth
B01A01	13+713	15	BG01A01	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A02	13+043	15	BG01A02	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A03	12+373	15	BG01A03	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A03	12+373	15	BG02A03	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A60	11+653	15	BG01A60	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A61	10+955	15	BG01A61	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A62	10+273	15	BG01A62	2	25kg Bulk Sample	UG01/P41	UG02/P41	UG04/P43	UG08/P47		
B01A01	13+713	15	MG01A01	2	Moisture Jar Sample	UG10/P49					
B01A02	13+043	15	MG01A02	2	Moisture Jar Sample	UG10/P49					
B01A03	12+373	15	MG01A03	2	Moisture Jar Sample	UG10/P49					
B01A03	12+373	15	MG02A03	2	Moisture Jar Sample	UG10/P49					
B01A60	11+653	15	MG01A60	2	Moisture Jar Sample	UG10/P49					
B01A61	10+955	15	MG01A61	2	Moisture Jar Sample	UG10/P49					
B01A62	10+273	15	MG01A62	2	Moisture Jar Sample	UG10/P49					

BG01AXX and MG01AXX are Pulverized Base Uncompacted Samples

BG02A03 and MG02A03 are Granular Subbase Uncompacted Samples

TABLE 14
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Combined Aggregate Samples
Laboratory: Agency

Sample Location No.	Constr. Sta.	Offset m	Sample No.	Lab Test No.	Description of Sample	Laboratory Handling & Test Sequencing					
						First	Second	Third	Fourth	Fifth	Sixth
	Plant		BU01A62		400kg Combined Agg Sample MTO Class 1	AG04/P14	AG01/P11 AG02/P12 AASHTO T100	PA DOT TM621 ASTM C1252	AASHTO T96 AASHTO T104	AASHTO T112 AASHTO T176 ASTM D4791	
	Plant		BU01A02		400kg Combined Agg Sample Superpave	AG04/P14	AG01/P11 AG02/P12 AASHTO T100	PA DOT TM621 ASTM C1252	AASHTO T96 AASHTO T104	AASHTO T112 AASHTO T176 ASTM D4791	

TABLE 15
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Asphalt Binder Samples
Laboratory: Agency

Sample Location No.	Constr. Sta.	Offset m	Sample No.	Lab Test No.	Description of Sample	Laboratory Handling & Test Sequencing					
						First	Second	Third	Fourth	Fifth	Sixth
	Plant		BC01A01		19 Litre Sample of 85-100 pen grade asc	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 AASHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A02		19 Litre Sample of PG 58-40	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 AASHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A03		19 Litre Sample of PG 58-34	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 AASHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A60		19 Litre Sample of PG 58-28	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 AASHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A61		19 Litre Sample of Polymermodified* PG 58-34 *Contractor/Supplier option	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 AASHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	

TABLE 16
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Other Than Superpave Laboratory Prepared Mixes
Laboratory: Agency
Surface Course Mixes at Design % AC

Sample Preparation No.	Gyratory Compaction			Compacted Sample No.	Laboratory Handling & Test Sequencing			
	At	Specimen Height mm.	Approx. Batch g.		First	Second	Third	Fourth
NA01A01	N_{Max}	115	4700	LA01A01	AC02/P02	PP-19*		
NA02A01	N_{Max}	115	4700	LA02A01	AC02/P02	PP-19*		
NA03A01	N_{Max}	115	4700	LA03A01	AC02/P02	PP-19*		
NA03A01	---	---	2000	---	AC03/P03			
NA04A01	7 % AV	140	5700	LA04A01	AC02/P02	AC05/P05		
NA05A01	7 % AV	140	5700	LA05A01	AC02/P02	AC05/P05		
NA06A01	7 % AV	140	5700	LA06A01	AC02/P02	AC05/P05		
NA07A01	7 % AV	140	5700	LA07A01	AC02/P02	AC05/P05		
NA08A01	7 % AV	140	5700	LA08A01	AC02/P02	AC05/P05		
NA09A01	7 % AV	140	5700	LA09A01	AC02/P02	AC05/P05		
NA01A03	N_{Max}	115	4700	LA01A03	AC02/P02	PP-19*		
NA02A03	N_{Max}	115	4700	LA02A03	AC02/P02	PP-19*		
NA03A03	N_{Max}	115	4700	LA03A03	AC02/P02	PP-19*		
NA03A03	---	---	2000	---	AC03/P03			
NA04A03	7 % AV	140	5700	LA04A03	AC02/P02	AC05/P05		
NA05A03	7 % AV	140	5700	LA05A03	AC02/P02	AC05/P05		
NA06A03	7 % AV	140	5700	LA06A03	AC02/P02	AC05/P05		
NA07A03	7 % AV	140	5700	LA07A03	AC02/P02	AC05/P05		
NA08A03	7 % AV	140	5700	LA08A03	AC02/P02	AC05/P05		
NA09A03	7 % AV	140	5700	LA09A03	AC02/P02	AC05/P05		

* Use bulk specific gravity N_{Design} estimated from gyrations vs density plots. Mark the top of GC specimen with a 'T', label the specimen

TABLE 16 (Cont.)
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Other Than Superpave Laboratory Prepared Mixes
Laboratory: Agency
Surface Course Mixes at Design % AC

Sample Preparation No.	Gyratory Compaction			Compacted Sample No.	Laboratory Handling & Test Sequencing			
	At	Specimen Height mm.	Approx. Batch g.		First	Second	Third	Fourth
NA01A60	N_{Max}	115	4700	LA01A60	AC02/P02	PP-19*		
NA02A60	N_{Max}	115	4700	LA02A60	AC02/P02	PP-19*		
NA03A60	N_{Max}	115	4700	LA03A60	AC02/P02	PP-19*		
NA03A60	---	---	2000	---	AC03/P03			
NA04A60	7 % AV	140	5700	LA04A60	AC02/P02	AC05/P05		
NA05A60	7 % AV	140	5700	LA05A60	AC02/P02	AC05/P05		
NA06A60	7 % AV	140	5700	LA06A60	AC02/P02	AC05/P05		
NA07A60	7 % AV	140	5700	LA07A60	AC02/P02	AC05/P05		
NA08A60	7 % AV	140	5700	LA08A60	AC02/P02	AC05/P05		
NA09A60	7 % AV	140	5700	LA09A60	AC02/P02	AC05/P05		
NA01A61	N_{Max}	115	4700	LA01A61	AC02/P02	PP-19*		
NA02A61	N_{Max}	115	4700	LA02A61	AC02/P02	PP-19*		
NA03A61	N_{Max}	115	4700	LA03A61	AC02/P02	PP-19*		
NA03A61	---	---	2000	---	AC03/P03			
NA04A61	7 % AV	140	5700	LA04A61	AC02/P02	AC05/P05		
NA05A61	7 % AV	140	5700	LA05A61	AC02/P02	AC05/P05		
NA06A61	7 % AV	140	5700	LA06A61	AC02/P02	AC05/P05		
NA07A61	7 % AV	140	5700	LA07A61	AC02/P02	AC05/P05		
NA08A61	7 % AV	140	5700	LA08A61	AC02/P02	AC05/P05		
NA09A61	7 % AV	140	5700	LA09A61	AC02/P02	AC05/P05		
NA01A62	N_{Max}	115	4700	LA01A62	AC02/P02	PP-19*		
NA02A62	N_{Max}	115	4700	LA02A62	AC02/P02	PP-19*		
NA03A62	N_{Max}	115	4700	LA03A62	AC02/P02	PP-19*		
NA03A62	---	---	2000	---	AC03/P03			
NA04A62	7 % AV	140	5700	LA04A62	AC02/P02	AC05/P05		
NA05A62	7 % AV	140	5700	LA05A62	AC02/P02	AC05/P05		
NA06A62	7 % AV	140	5700	LA06A62	AC02/P02	AC05/P05		
NA07A62	7 % AV	140	5700	LA07A62	AC02/P02	AC05/P05		
NA08A62	7 % AV	140	5700	LA08A62	AC02/P02	AC05/P05		
NA09A62	7 % AV	140	5700	LA09A62	AC02/P02	AC05/P05		

* Use bulk specific gravity N_{Design} established from Gyrations vs Density plots

Mark the top of GC specimen with a 'T', label the specimen

TABLE 17

Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON - Section 870902

Laboratory Tracking Table for Superpave Laboratory Prepared Mixes

Laboratory: Agency

Surface Course Mixes at Design % AC

Sample Preparation Number	Gyratory Compaction			Compacted Sample Number	Laboratory Handling & Test Sequencing				
	\t	Specimen Height (mm)	Approx. Batch (g)		First	Second	Third	Fourth	Fifth
NA01A02	N_{Max}	115	4700	LA01A02	AC02/P02	PP-19			
NA02A02	N_{Max}	115	4700	LA02A02	AC02/P02	PP-19			
NA03A02	N_{Max}	115	4700	LA03A02	AC02/P02	PP-19			
NA04A02	N_{Max}	115	4700	LA04A02	AC02/P02	PP-19			
NA05A02	N_{Max}	115	4700	LA05A02	AC02/P02	PP-19			
NA06A02	N_{Max}	115	4700	LA06A02	AC02/P02	PP-19			
NA07A02	7% AV	140	5700	LA07A02	AC02/P02	SRTC			
NA08A02	7% AV	140	5700	LA08A02	SRTC				
NA09A02	7% AV	140	5700	LA09A02	AC02/P02	AC05/P05			
NA10A02	7% AV	140	5700	LA10A02	AC02/P02	AC05/P05			
NA11A02	7% AV	140	5700	LA11A02	AC02/P02	AC05/P05			
NA12A02	7% AV	140	5700	LA12A02	AC02/P02	AC05/P05			
NA13A02	7% AV	140	5700	LA13A02	AC02/P02	AC05/P05			
NA14A02	7% AV	140	5700	LA14A02	AC02/P02	AC05/P05			
NA15A02	7% AV	140	5700	LA15A02	AC02/P02	LCL			
NA15A02	---	---	2000	---	AC03/P03				
NA16A02	7% AV	140	5700	LA16A02	LCL				
NA17A02	7% AV	140	5700	LA17A02	LCL				
NA18A02	7% AV	140	5700	LA18A02	LCL				
NA19A02	7% AV	140	5700	LA19A02	LCL				
NA20A02	7% AV	140	5700	LA20A02	LCL				
NA21A02	7% AV	140	5700	LA21A02	LCL				
NA22A02	7% AV	140	5700	LA22A02	LCL				
NA23A02	7% AV	140	5700	LA23A02	SRTC				
NA24A02	7% AV	140	5700	LA24A02	SRTC				
NA25A02	7% AV	140	5700	LA25A02	SRTC				
NA26A02	7% AV	140	5700	LA26A02	SRTC				
NA27A02	7% AV	140	5700	LA27A02	SRTC				
NA28A02	7% AV	140	5700	LA28A02	SRTC				
NA29A02	7% AV	140	5700	LA29A02	SRTC				
NA30A02	7% AV	140	5700	LA30A02	SRTC				
NA31A02	7% AV	140	5700	LA31A02	SRTC				
NA32A02	7% AV	140	5700	LA32A02	SRTC				
NA33A02	7% AV	140	5700	LA33A02	SRTC				
NA34A02	7% AV	140	5700	LA34A02	SRTC				
NA35A02	7% AV	140	5700	LA35A02	SRTC				
NA36A02	7% AV	140	5700	LA36A02	SRTC				
NA37A02	7% AV	140	5700	LA37A02	SRTC				
NA38A02	7% AV	140	5700	LA38A02	AC02/P02	SRTC			
NA39A02	7% AV	140	5700	LA39A02	SRTC				
NA40A02	7% AV	140	5700	LA40A02	SRTC				

LCL - Package and send to LTPP Contractor Laboratory

SRTC - Package and send to Superpave Regional Test Center

TABLE 18
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Quality Control other than Superpave - AC Mixes
Laboratory: Agency/Contractor (Field)

Sample Location Number	Constr. Sta.	Offset M.	Sample No.	Lab. Test Number	Description of Sample	Laboratory Handling & Testing Sequencing					
						First	Second	Third	Fourth	Fifth	Sixth
B01A01	13+850	1	DA01A01	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B02A01			DA02A01	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B03A01	13+810	1	DA03A01	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B04A01			DA04A01	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B05A01	13+790	1	DA05A01	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B06A01			DA06A01	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B01A03	12+510	1	DA01A03	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B02A03			DA02A03	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B03A03	12+470	1	DA03A03	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B04A03			DA04A03	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B05A03	12+450	1	DA05A03	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B06A03			DA06A03	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B01A60	11+790	1	DA01A60	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B02A60			DA02A60	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B03A60	11+760	1	DA03A60	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B04A60			DA04A60	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B05A60	11+740	1	DA05A60	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B06A60			DA06A60	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			

TABLE 18 (Cont.)
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for Quality Control other than Superpave - AC Mixes
Laboratory: Agency/Contractor (Field)

Sample Location Number	Constr. Sta.	Offset M.	Sample No.	Lab. Test Number	Description of Sample	Laboratory Handling & Testing Sequencing					
						First	Second	Third	Fourth	Fifth	Sixth
B01\61	11+100	1	D\01\61	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B02A61			D\02\61	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B03A61	11+070	1	D\03\61	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B04\61			D\04A61	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B05\61	11+040	1	D\05A61	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B06A61			D\06A61	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B01A62	10+410	1	D\01A62	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B02A62			D\02A62	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B03A62	10+380	1	D\03A62	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B04\62			D\04\62	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B05\62	10+360	1	D\05\62	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B06\62			DA06\62	3	Gyratory Compactor @ N_{Max}	AASHTO TP4	AC02/P02	PP19			
B01\01		1	B\01\01	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B06A01		1	BA06A01	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B01A03		1	BA01A03	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B06A03		1	BA06A03	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B01A60		1	BA01A60	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B06\60		1	BA06A60	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B01A61		1	B\01A61	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B06A61		1	BA06\61	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B01\62		1	B\01\62	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			
B06A62		1	BA06A62	3	Uncompacted Mix	AC03/P03	AC04/P04	AG04/P14			

TABLE 19

Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON - Section 870902

Laboratory Tracking Table for Superpave Mixes (Field Samples)

Laboratory: Agency

SURFACE COURSE MIX

Sample Location No.	Sample No.	Lab Test No.	Description of Sample	Laboratory Handling & Test Sequencing					
				Specimen Height mm.	Approx. Batch g.	First	Second	Third	Fourth
B01A02	DA01A02	3	GCS field sample @ 3% AV	140	5700	AASHTO TP4	SRTC		
B02A02	DA02A02	3	GCS field sample @ N_{Max}	115	4700	AASHTO TP4	AC02/P02	PP-19	
B03A02	DA03A02	3	GCS field sample @ N_{Max}	115	4700	AASHTO TP4	AC02/P02	PP-19	
B04A02	DA04A02	3	GCS field sample @ N_{Max}	115	4700	AASHTO TP4	AC02/P02	PP-19	
B05A02	DA05A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B06A02	DA06A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	AC02/P02	SRTC	
B07A02	DA07A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B08A02	DA08A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B09A02	DA09A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B05A02	BA05A02	3	Uncompacted Plant Mix	---	2000	AC03/P03	AC04/P04	AG04/P14	
B06A02	BA06A02	3	Uncompacted Plant Mix	---	2000	AC03/P03	AC04/P04	AG04/P14	
B10A02	DA10A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B11A02	DA11A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B12A02	DA12A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B13A02	DA13A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B14A02	DA14A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B15A02	DA15A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B16A02	DA16A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	AC02/P02	LCL	
B17A02	DA17A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B18A02	DA18A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		

Note: For SRTC substitute MRL - Materials Reference Library

TABLE 19 (Cont.)
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON - Section 870902
Laboratory Tracking Table for Superpave Mixes (Field Samples)
Laboratory: Agency

SURFACE COURSE MIX

Sample Location No.	Sample No.	Lab Test No.	Description of Sample	Laboratory Handling & Test Sequencing					
				Specimen Height mm.	Approx. Batch g.	First	Second	Third	Fourth
B19A02	DA19A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B20A02	DA20A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B21A02	DA21A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B22A02	DA22A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	AC02/P02	SRTC	
B23A02	DA23A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B24A02	DA24A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B25A02	DA25A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B26A02	DA26A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B27A02	DA27A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B28A02	DA28A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B29A02	DA29A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B30A02	DA30A02	3	GCS field sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B31A02	DA31A02	3	GCS field sample @ N_{Max}	115	4700	AASHTO TP4	AC02/P02	PP-19	
B32A02	DA32A02	3	GCS field sample @ N_{Max}	115	4700	AASHTO TP4	AC02/P02	PP-19	
B33A02	DA33A02	3	GCS field sample @ N_{Max}	115	4700	AASHTO TP4	AC02/P02	PP-19	
B34A02	DA34A02	3	GCS field sample @ 3% AV	140	5700	AASHTO TP4	SRTC		
B34A02	BA34A02	3	Uncompacted Plant Mix	---	2000	AC03/P03	AC04/P04	AG04/P14	

Note: QC QA specimen DA02A02-DA04A02 DA31A02-DA33A02
are compacted in the field from field samples stored in insulated containers
Other specimen are split-off to size in the field while still hot They are reheated as needed for compaction.
GCS - Gyratory Compacted Specimen
SRTC - Superpave Regional Test Center *(For SRTC substitute MRL)*
LCL - LTPP Contractor Laboratory
MRL - Materials Reference Library

TABLE 20.1
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA ON
Superpave Regional Test Center - Tracking Table
Laboratory Prepared Specimen *(to be sent to MRL)*

GCS #	Test Sequence	
	First	Second
LA07A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
LA08A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
LA23A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
LA24A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
LA25A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
LA26A02	AC02/P02	SST-1*
LA27A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
LA28A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
LA29A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
LA30A02	AC02/P02	SST-2*
LA31A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA32A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA33A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA34A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA35A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA36A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA37A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA38A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA39A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA40A02	AC02/P02	SP-IT*

* Extra Sample, DO NOT DISCARD

Note: The 140mm SPECIMEN are to be cut into two replicate specimen and labeled 'A' for the top and 'B' for the bottom of the specimen Mount the bottom of A and the top of B to the moveable top platten of the Shear Tester

Note: *These specimens are to be sent to the MRL for storage until SRTC test procedures are finalized*

TABLE 20.1 (Cont.)
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA ON
Superpave Regional Test Center - Tracking Table
Plant Mix Specimen *(to be sent to MRL)*

GCS #	Test Sequence	
	First	Second
DA01A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
DA34A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
DA06A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA10A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA24A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA28A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA07A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA11A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA23A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA27A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA08A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA12A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA13A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA14A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA19A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA20A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA21A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA22A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA25A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA26A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance

Note: *These specimens are to be sent to the MRL for storage until SRTC test procedures are finalized*

TABLE 20.2
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA ON
Superpave Regional Test Center - Tracking Table
Core At Time A=O *(do not take cores until advised)*

Core Location #	Core Sample #	Lab Test #	Handling and Testing Sequence			
			First	Second	Third	Disposal
C01A02	CA01A02	1	AC01/P01	AC02/P02	SP-IT	No
C08A02	CA08A02	2	AC01/P01	AC02/P02	SP-IT	No
C10A02	CA10A02	1	AC01/P01	AC02/P02	SP-IT	No
C13A02	CA13A02	1	AC01/P01	AC02/P02	SP-IT	No
C17A02	CA17A02	1	AC01/P01	AC02/P02	SP-IT	No
C18A02	CA18A02	1	AC01/P01	AC02/P02	SP-IT	No
C20A02	CA20A02	1	AC01/P01	AC02/P02	SP-IT	No
C27A02	CA27A02	2	AC01/P01	AC02/P02	SP-IT	No
C29A02	CA29A02	2	AC01/P01	AC02/P02	SP-IT	No
C34A02	CA34A02	2	AC01/P01	AC02/P02	SP-IT	No
C04A02	CA04A02	1	AC01/P01	AC02/P02	SST-1	No
C30A02	CA30A02	2	AC01/P01	AC02/P02	SST-1	No
C12A02	CA12A02	1	AC01/P01	AC02/P02	SST-2	No
C22A02	CA22A02	2	AC01/P01	AC02/P02	SST-2	No
C09A02	CA09A02	1	AC01/P01	AC02/P02	SST-3	No
C26A02	CA26A02	2	AC01/P01	AC02/P02	SST-3	No

Notes: The core specimen shall be tested in the following order -
- core examination and thickness measurements
- trim and cut core to testing geometry
- determine bulk density
- prepare and mount the sized specimen for noted test

SP-IT - Superpave Indirect Tensile Strength and Creep Compliance
SST-1 - Frequency Sweep and Simple Shear
SST-2 - Volumetric and Uniaxial Strain
SST-3 - Repeated Shear @ Constant Stress Ratio

TABLE 21.1
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA ON
LTPP Contractor Laboratory Tracking Table for
Gyratory Compacted Laboratory & Field Superpave Mixes

GCS #	Test Sequence			
	First	Second		
LA15A02	AC02/P02	AC07/P07	ITS	**Note:** Trim the 150mm dia. x 140mm height specimen to 100mm diameter x 65mm height (central portion of specimen)
LA16A02	AC02/P02	AC07/P07		
LA17A02	AC02/P02	AC07/P07		
LA18A02	AC02/P02	AC07/P07		
LA19A02	AC02/P02	AC06/P06		
LA20A02	AC02/P02	AC06/P06		
LA21A02	AC02/P02	AC06/P06		
LA22A02	AC02/P02	AC06/P06		
DA05A02	AC02/P02	AC07/P07	ITS	
DA09A02	AC02/P02	AC07/P07		
DA15A02	AC02/P02	AC06/P06		
DA16A02	AC02/P02	AC06/P06		
DA17A02	AC02/P02	AC07/P07		
DA18A02	AC02/P02	AC06/P06		
DA29A02	AC02/P02	AC07/P07		
DA30A02	AC02/P02	AC06/P06		

TABLE 21.2
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA ON
LTPP Contractor Laboratory - Tracking Table for Cores
Core At Time A=O

Core Location #	Core Sample #	Lab Test #	Test Sequence		
			First	Second	Third
C03A02	CA03A02	1	AC01/P01	AC02/P02	AC06/P06
C07A02	CA07A02	2	AC01/P01	AC02/P02	AC07/P07 ITS
C14A02	CA14A02	1	AC01/P01	AC02/P02	AC06/P06
C16A02	CA16A02	1	AC01/P01	AC02/P02	AC07/P07
C21A02	CA21A02	1	AC01/P01	AC02/P02	AC07/P07
C23A02	CA23A02	2	AC01/P01	AC02/P02	AC06/P06
C31A02	CA31A02	2	AC01/P01	AC02/P02	AC07/P07
C32A02	CA32A02	2	AC01/P01	AC02/P02	AC06/P06

* The visual examination and thickness measurement and bulk density determinations are included in the LTPP Contractor Laboratory Procedures for ACO6/P06 and AC07/P07. Only the top surface layer is tested for Creep Compliance. Resilient Modulus and Indirect Tensile Strength

TRIM CORES TO FORM TEST SPECIMEN 100mm dia. x 65mm HEIGHT

TABLE 22.1

Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON

Laboratory Tracking Table for AC Cores (Mixes other than Superpave)

Laboratory: Agency - at Interval A

Core Location No.	Constr. Sta.	Offset m	Core Sample No.	Lab Test No.	Laboratory Handling & Testing Sequencing								
					First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C01A01	13+938 5	1 1	CA01A01	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A01	13+937	0 6	CA02A01	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A01	13+935 5	1 1	CA03A01	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A01	13+934	0 6	CA04A01	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				For	TP5
C05A01	13+714	0 6	CA05A01	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C06A01	13+712 5	1 1	CA06A01	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C07A01	13+711	0 6	CA07A01	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					
C08A01	13+709 5	1 1	CA08A01	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C01A03	12+598 5	1 1	CA01A03	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A03	12+597	0 6	CA02A03	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A03	12+595 5	1 1	CA03A03	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A03	12+594	0 6	CA04A03	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				For	TP5
C05A03	12+374	0 6	CA05A03	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C06A03	12+372 5	1 1	CA06A03	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C07A03	12+371	0 6	CA07A03	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					
C08A03	12+369 5	1 1	CA08A03	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C01A60	11+878 5	1 1	CA01A60	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A60	11+877	0 6	CA02A60	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A60	11+875 5	1 1	CA03A60	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A60	11+874	0 6	CA04A60	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				For	TP5
C05A60	11+654	0 6	CA05A60	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C06A60	11+652 5	1 1	CA06A60	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C07A60	11+651	0 6	CA07A60	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					
C08A60	11+649 5	1 1	CA07A60	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		

TABLE 22.1 (Cont.)
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for AC Cores (Mixes other than Superpave)
Laboratory: Agency - at Interval A

Core Location No.	Constr. Sta.	Offset m	Core Sample No.	Lab Test No.	Laboratory Handling & Testing Sequencing								
					First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C01A61	11+180 5	1 1	CA01A61	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A61	11+179	0 6	CA02A61	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A61	11+177 5	1 1	CA03A61	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A61	11+176	0 6	CA04A61	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				For	TP5
C05A61	10+956	0 6	CA05A61	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C06A61	10+954 5	1 1	CA06A61	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C07A61	10+953	0 6	CA07A61	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					
C08A61	10+951 5	1 1	CA08A61	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C01A62	10+498 5	1 1	CA01A62	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A62	10+497	0 6	CA02A62	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A62	10+495 5	1 1	CA03A62	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A62	10+494	0 6	CA04A62	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				For	TP5
C05A62	10+274	0 6	CA05A62	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C06A62	10+272 5	1 1	CA06A62	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C07A62	10+271	0 6	CA07A62	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					
C08A62	10+269 5	1 1	CA08A62	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		

TABLE 22.2
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for AC Cores (Superpave)
Laboratory: Agency - at Interval A

Core Location No.	Constr. Sta.	Offset m	Core Sample No.	Lab Test No.	Laboratory Handling & Testing Sequencing								
					First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C02A02	13+267	0 6	CA02A02	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Blend	T49
C06A02	13+043	0 6	CA06A02	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C15A02	13+267	2 4	CA15A02	1	AC01/P01	AC02/P02	AC03/P03	AE01/P21				Asphalt	AE05/P25
C19A02	13+261	2 4	CA19A02	1	AC01/P01	AC02/P02	AC04/P01	AE01/P21				For	TP5
C28A02	13+255	2 4	CA28A02	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C33A02	13+043	2 1	CA33A02	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C11A02	13+037	2 4	CA11A02	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C24A02	13+029 5	2 4	CA24A02	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C05A02	13+044 5	1 1	CA05A02*	2	AC01/P01								
C25A02	13+041 5	2 4	CA25A02*	2	AC01/P01								

* Spare

TABLE 23
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Laboratory Tracking Table for AC Cores at Intervals t (B through F)
Laboratory: Agency

Sample Location No.	Constr. Sta.	Offset m.	Sample No.	Lab Test No.	Laboratory Handling & Testing Sequencing								
					First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C01tXX	Varies	1 1	CA01tXX	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02tXX	with	0 6	CA02tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03tXX	t=B,	1 1	CA03tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04tXX	C,	0 6	CA04tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				For	TP5
C05tXX	D,	0 6	CA05tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1, TP3
C06tXX	E,	1 1	CA06tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	AE03/P23
C07tXX	F	0 6	CA07tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					
C08tXX		1 1	CA08tXX	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		

Construction Stations, m

@ t =	B	C	D	E	F
C01	-50 5	-42 5	-34 5	-27	-18 5
C02	-49	-41	-33	-25	-17
C03	-47 5	-39 5	-31 5	-24	-15 5
C04	-46	-38	-30	-22	-14
C05	174	182	190	198	206
C06	175 5	183 5	191 5	200	207 5
C07	177	185	193	201	209
C08	178 5	186 5	194 5	203	210 5

Note XX - Test Section Numbers 01, 02, 03, 60, 61, and 62

TABLE 24
Ontario SPS-9A PROJECT 870900, HWY 17 WB, PETAWAWA, ON
Summary of Gyratory Compaction Specimen ID's

Other than Superpave Mixes

Material Description	Project Designation	Laboratory Mixes and Paver Samples	Agency Laboratory		SRTC	LCL
			Gyratory Compacted Specimen ID			
			QC/QA, Volumetrics @ N_{Max}	For Moisture Susceptibility @ 7% AV	For Performance Testing @ 7% AV and 3% AV	For Mix Characterization @ 7% AV
AC Surface Course	HDS 19mm Max	NA01AXX-NA09AXX BA01AXX-BA06AXX	LA01AXX-LA03AXX DA01AXX-DA06AXX	LA04AXX-LA09AXX	Note. XX Represents Test Section Numbers 01, 03, 60, 61 and 62	
SUPERPAVE MIXES - TEST SECTION 02						
AC Pulverized Base		BG01A02 (MRL)				
AC Binder Course	HDB 25mm Max	BA50A02 (MRL)				
AC Surface Course	HDS 19mm Max	NA01A02-NA40A02 BA01A02-BA34A02	LA01A02-LA06A02 DA02A02-DA04A02 DA31A02-DA33A02	LA09A02-LA14A02 ---	LA07A02-LA08A02 (3% AV) LA23A02-LA40A02 (7% AV) DA01A02, DA34A02 (3% AV) DA06A02-DA08A02 (7% AV) DA10A02-DA14A02 (7% AV) DA19A02-DA28A02 (7% AV)	LA15A02-LA22A02 DA05A02, DA09A02 -DA18A02 DA29A02-DA30A02

SRTC - SUPERPAVE REGIONAL TEST CENTER, LCL - LTPP CONTRACTOR LABORATORY, MRL - MATERIALS REFERENCE LIBRARY

Note: For SRTC substitute MRL

TABLE 25

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Bulk Subgrade, Subbase and Pulverized Base Samples

Test Section	Date of Sample	Sample Location	Sample Station		Sample Number		
			Const-m	SHRP-m	Subgrade	Subbase	Base
870901	3-Oct-96	B01A01	13 + 713	5 + 15	BS01A01		BG01A01
870902	3-Oct-96	B01A02	13 + 043	5 + 15	BS01A02		BG01A02
870903	3-Oct-96	B01A03	12 + 373	5 + 15	BS01A03	BG02A03	BG01A03
870960	3-Oct-96	B01A60	11 + 653	5 + 15	BS01A60		BG01A60
870961	3-Oct-96	B01A61	10 + 955	5 + 15	BS01A61		BG01A61
870962	3-Oct-96	B01A62	10 + 273	5 + 15	BS01A62		BG01A62

TABLE 26

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Marshall Mix Design, Quality Control and Quality Assurance Test Results
HL4 Binder Course - Test Sections 870901 and 870962
(Percent Passing each Sieve Size)

		Specifications		Test Section 01			Test Section 62		
				16-Oct-96			1-Nov-96		
Sieve Size mm	JMF	HL4 Binder Gradation	Tolerable Limits from JMF %	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 2 Samples	Lots 1-4 QC Avg. of 12 Samples	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 4 Samples	Lots 1-4 QC Avg. of 10 Samples
16.0	99.4	98 - 100	+/- 5	99.9	99.2	99.6	99.5	99.3	98.9
9.5	74.9	62 - 82	+/- 5	74.0	73.0	73.9	75.7	72.0	73.8
2.36	46.0	27 - 60	+/- 4	44.0	43.6	43.1	43.2	42.2	42.1
0.600	23.3	8 - 47	+/- 4	25.3	24.8	24.8	25.4	24.7	24.6
0.150	7.2	1 - 10	+/- 4	7.7	7.9	7.7	8.2	8.5	7.7
Marshall Properties									
% Voids	4.1	3.5 - 4.5	+/- 0.5	5.0	3.2	4.8	3.5	4.5	3.8
Flow (Min)	11.5	8.0 min		9.9		9.8	11.8		10.3
BRD	2.361			2.337		2.343	2.367		2.360
Type AC				85 - 100 PEN			PG 58 - 40 Polymer		

TABLE 27

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Superpave Mix Design, Quality Control and Quality Assurance Test Results 1996
19.0 mm Binder Course - Test Sections 870902, 870903, 870960 and 870961
(Percent Passing each Sieve Size)

		Specifications		Test Section 02			Test Section 03		
				24-Oct-96		24/25-Oct-96	28-Oct-96		
Sieve Size mm	JMF	Control Pts. & Recommd Restricted Zone (R)	Tolerance Limits from JMF	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 4 Samples	Lots 1-4 QC Avg. of 12 Samples	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 4 Samples	Lots 1-4 QC Avg. of 10 Samples
19.0	100.0	90.0 - 100.0	+/- 5%	100.0	100.0	99.9	100.0	100.0	100.0
12.5	87.1	90.0 - 100.0	+/- 5	85.2	98.5	82.3	85.1	85.0	84.7
4.75	39.6		+/- 5	36.0	38.0	34.9	37.6	37.3	36.3
2.36		34.6 R		24.7	25.2	24.4	26.2	26.5	25.2
0.600	15.7	16.7 - 20.7 R	+/- 4	14.3	14.2	14.2	15.2	15.2	14.8
0.150	6.0		+/- 4	6.0	6.5	6.1	6.7	7.2	6.6
Hot Mix									
Air Voids %	4.0	4.0	+/- 0.5	5.0	5.0	4.9	4.4	4.8	4.5
BRD				2.374		2.376	2.380		2.379
Type AC	PG 58-34			PG 58-40			PG 58-34		

TABLE 27 (Continued)

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Superpave Mix Design, Quality Control and Quality Assurance Test Results 1996
19.0 mm Binder Course - Test Sections 870902, 870903, 870960 and 870961
(Percent Passing each Sieve Size)

		Specifications		Test Section 60			Test Section 61		
				29-Oct-96			31-Oct-96		
Sieve Size mm	JMF	Control Pts. & Recommd Restricted Zone (R)	Tolerance Limits from JMF	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 10 Samples	Lots 1-4 QC Avg. of 10 Samples	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 4 Samples	Lots 1-4 QC Avg. of 10 Samples
19.0	100.0	90.0 - 100.0	+/- 5%	100.0	100.0	100.0	100.0	100.0	100.0
12.5	87.1	90.0 - 100.0	+/- 5	83.5	83.7	83.3	80.9	83.1	87.1
4.75	39.6		+/- 5	35.8	34.0	35.3	35.4	35.8	39.6
2.36		34.6 R		24.9	23.7	24.7	25.4	25.9	28.3
0.600	15.7	16.7 - 20.7 R	+/- 4	14.4	14.4	14.5	15.5	15.4	15.7
0.150	6.0		+/- 4	6.5	6.8	6.6	6.1	7.3	6.4
Hot Mix									
Air Voids %	4.0	4.0	+/- 0.5	4.7	4.9	4.7	4.4	4.6	4.4
BRD				2.372		2.373	2.378		2.378
Type AC	PG 58-34			PG 58-28			PG 58-34		

TABLE 28

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Marshall Mix Design, Quality Control and Quality Assurance Test Results
HL3 Mod. Surface Course - Test Sections 870901 and 870962
(Percent Passing each Sieve Size)

		Specifications		Test Section 01			Test Section 62		
				9-Jun-97			17-Jun-97		
Sieve Size mm	JMF	HL3 Mod. Surface Course Gradation and Properties	Tolerance Limits from JMF %	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 7 Samples	Lots 1-4 QC Avg. of 10 Samples	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 8 Samples	Lots 1-4 QC Avg. of 10 Samples
19.0	100								
13.2	99.5	98 - 100	+/- 5	100.0	99.5	100.0	97.1	99.4	97.6
4.75	50.0	50 - 60	+/- 5	50.6	53.5	50.2	49.3	48.5	49.1
1.18	34.6	25 - 58	+/- 4	35.2	36.6	34.4	33.8	33.3	33.5
0.300	9.9	7 - 26	+/- 4	14.5	14.8	13.0	10.1	11.0	10.2
0.075	3.5	0 - 5	+/- 2	3.0	3.1	3.0	1.8	2.8	1.9
Marshall Properties									
% Voids	4.0	4.0	+/- 0.5	4.2		4.0	3.5		3.5
Flow	11.7	8% min		12.1		12.3	13.6		13.0
BRD	2.348			2.345		2.351	2.345		2.348
Type AC	85 - 100			85/100 Pen			PG 58-40		

TABLE 29

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Superpave Mix Design, Quality Control and Quality Assurance Test Results
12.5 mm Surface Course - Test Sections 870902, 870903, 870960 and 870961
(Percent Passing each Sieve Size)

		Specifications		Test Section 02			Test Section 02A		Test Section 03		
				10-Jun-97			18-Jun-97		12-Jun-97		
Sieve Size mm	JMF	Control Pts. & Recommd Restricted Zone (R)	Tolerance Limits from JMF %	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 7 Samples	Lots 1-4 QC Avg. of 10 Samples	Lot 1 QC Avg. of 4 Samples	Lot 1 QA Avg. of 4 Samples	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 8 Samples	Lots 1-4 QC Avg. of 10 Samples
16.0	100	100.0		100	100	100	100	100	100	100	100
13.2	99.6	90.0 - 100.0	+/- 5	100	99.5	100	99.6	99.6	100	99.7	99.9
9.5	83.6		+/- 5	86.9	88.2	86.1	83.6	84.9	87.4	88.5	85.8
4.75	47.8		+/- 5	49.7	57.9	51.9	47.8	48.2	52.3	54.5	51.1
2.36	32.6	28.0 - 58.0	+/- 4	32.5	32.6	35.2	33.5	35.1	36.5	38.1	36.0
2.36		39.1 R		32.5	32.6	35.2	33.5	35.1	36.5	38.1	36.0
1.18	24.6	25.6 - 31.6 R	+/- 4	24.9	25.2	26.8	26.8	28.0	27.8	28.7	27.6
0.600	19.4	19.1 - 23.1 R	+/- 4	20.3	20.3	21.6	21.9	22.9	22.1	22.5	22.1
0.300	13.6	15.5 R	+/- 4	14.6	15.1	15.2	15.4	16.9	15.4	16.0	15.4
0.150	8.2		+/- 4	8.7	9.8	8.8	8.4	10.3	8.5	9.1	8.5
0.075	4.7	2.0 - 10.0	+/- 2	4.5	5.1	4.3	3.3	5.4	4.0	4.5	3.9
Hot Mix											
AC %	4.9		+/- 0.3	5.0	4.9	5.1	4.80	4.9	5.0	5.0	5.0
Air Voids %	4.0		+/- 0.5	3.6		3.2	3.2		4.4		4.2
VMA %	15.6	14 min	+/- 1	14.5		14.6	13.7		14.1		14.0
BRD				2.376		2.379	2.388		2.366		2.369
MRD				2.466		2.460	2.466		2.474		2.474
Type AC	PG 58-40			PG 58-40			PG 58-40		PG 58-34		

TABLE 29 (Continued)

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Superpave Mix Design, Quality Control and Quality Assurance Test Results
12.5 mm Surface Course - Test Sections 870902, 870903, 870960 and 870961
(Percent Passing each Sieve Size)

		Specifications		Test Section 60			Test Section 61		
				12-Jun-97			16-Jun-97		
Sieve Size mm	JMF	Control Pts. & Recommd Restricted Zone (R)	Tolerance Limits from JMF %	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 8 Samples	Lots 1-4 QC Avg. of 10 Samples	Lot 2 QC Avg. of 4 Samples	Lot 2 QA Avg. of 8 Samples	Lots 1-4 QC Avg. of 10 Samples
16.0	100	100.0		100	100	100	100	100	100
13.2	99.6	90.0 - 100.0	+/- 5	99.3	99.2	99.5	97.3	99.1	97.9
9.5	83.6		+/- 5	83.9	85.9	83.8	82.4	87.0	82.9
4.75	47.8		+/-5	48.7	51.9	48.6	48.3	55.8	48.1
2.36	32.6	28.0 - 58.0	+/- 4	33.8	37.6	33.9	34.0	37.8	34.0
2.36		39.1 R		33.8	37.6	33.9	34.0	37.8	34.0
1.18	24.6	25.6 - 31.6 R	+/- 4	26.4	28.9	26.3	26.5	28.7	26.6
0.600	19.4	19.1 - 23.1 R	+/- 4	21.3	22.1	21.1	21.4	22.0	21.5
0.300	13.6	15.5 R	+/- 4	14.8	15.5	14.7	14.6	15.8	15.0
0.150	8.2		+/- 4	8.0	9.0	8.1	7.7	9.1	8.1
0.075	4.7	2.0 - 10.0	+/- 2	3.3	4.7	3.5	3.1	4.6	3.4
Hot Mix									
AC %	4.9		+/- 0.3	4.9	5.1	4.9	4.9	4.9	4.9
Air Voids %	4.0		+/- 0.5	3.4		3.5	3.5		3.3
VMA %	15.6	14 min	+/- 1	13.2		13.2	13.4		13.3
BRD				2.391		2.390	2.382		2.385
MRD				2.475		2.476	2.469		2.467
Type AC	PG 58-40			PG 58-28			PG 58-34		

TABLE 30

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Sampling, Field Testing and Construction Dates

Activity	Test Section						
	01	02	03	60	61	62	02A
Shoulder Probe	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	*
Bases & Subgrade							
Pulv. Completed	9/16/96	9/16/96	9/16/96	9/16/96	9/16/96	9/16/96	
Bulk Sample	10/3/96	10/3/96	10/3/96	10/3/96	10/3/96	10/3/96	
Fine Grading	10/16/96	10/22/96	10/28/96	10/29/96	10/31/96	11/1/96	
5 Pt. Levels	10/16/96	10/24/96	10/28/96	10/29/96	10/31/96	11/1/96	
Density/Moisture	10/16/96	10/22/96		10/29/96	10/31/96	11/1/96	
Binder Courses							
Placed	10/16/96	10/24/96	10/28/96	10/29/96	10/31/96	11/1/96	11/1/96
Densities	10/31/96	10/24/96	10/30/96	11/2/96	11/2/96	11/2/96	
5 Pt. Levels	10/16/96	10/25/96	10/28/96	10/29/96	10/31/96	11/1/96	
Surface Course							
Placed	6/9/97	6/10/97	6/11/97	6/12/97	6/16/97	6/17/97	6/18/97
Densitites	6/9/97	6/10/97	6/11/97	6/12/97	6/16/97	6/17/97	6/18/97
5 Pt. Levels							
Binder (retaken)	6/8/97	6/9/97	6/10/97	6/11/97	6/12/97	6/16/97	6/18/97
Surface	6/9/97	6/10/97	6/11/97	6/12/97	6/16/97	6/17/97	
Post-Const. Cores							
t = 0	6/20/97	6/19/97	6/20/97	6/20/97	6/20/97	6/20/97	

* *A segment of the surface course of 62 (transition area) used the Superpave Mix Design (PG 58-40) instead of Marshall Mix Design.*

TABLE 31

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Binder and Surface Course Compacted Thicknesses
5 Point Levels

Test Section	Binder Course mm				Surface Course Mix			
	Avg.	Min.	Max.	St. Dev.	Avg.	Min.	Max.	St. Dev.
870901	79	59	101	11	72	62	86	6.3
870902	91	65	101	8.2	59	51	71	4.1
870903	76	59	95	8.1	67	59	80	5.2
870960	63	51	71	4.7	67	59	80	3.5
870961	63	45	77	9.1	64	55	73	3.5
870962	65	44	81	8.3	69	59	85	5.7

TABLE 32

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Summary of Bituminous Binder Course Construction Data

Test Section	Pavement Date	Binder Type	Haul Distance km	Avg. Load to Unload Time	Time to Pave Test Section	HM Temp		Air Temp and Weather Deg. C	Thickness mm			
						Plant Deg. C	Road Deg. C*		Place Nom.	Compacted		
										Avg.	Max.	Min.
870901	10/16/96	85/100	10	41 min.	46 min.	143	134	8 deg. 10 a.m. partly cloudy	80mm	79	101	59
870902	10/24/96	PG 58-40	11			150	138	8 deg. 2 p.m. light rain	80	91	101	65
870903	10/28/96	PG 58-34	11	46	30	160	143	10 deg. 11 a.m. cloudy, windy	75	76	95	59
870960	10/29/96	PG 58-28	12	100	42	152	132	9 deg. 11 a.m. sunny	75	63	71	51
870961	10/31/96	PG 58-34	13	29	56	150	131	0 deg. 11 a.m. snow flurries	78	63	77	45
870962	11/1/96	PG 58-40	13	40	90	165	132	-2 deg. 2 p.m. snow flurries	78	65	81	44

* Behind Paver

TABLE 33

Ontario SPS-9A Project 870900, Hwy 17 WB, PETAWAWA, ON
Nuclear Density, Moisture and Compaction Test Results
Pulverized Base, Binder and Surface Bituminous Courses

		Pulverized Base				Binder Course				Surface Course			
Test Section	Test Date	Density kg/m3	MRD kg/m3	Moisture %	% Comp.	Test Date	Density kg/m3	MRD kg/m3	% Comp. (1)	Test Date	Density kg/m3	MRD kg/m3	% Comp. (2)
870901	10/16/96	2057	2148	4.1	95.7	5/31/96	2288	2465	92.8	6/9/97	2328	2447	96.6
870902	10/22/96	2089	2148	4 9	97 2	10/28/96	2225	2500	91 0	6/10/97	2295	2466	94.5
870903	10/22/96	2077	2148	5.3	97.3	10/30/96	2227	2500	90.9	6/11/97	2287	2466	94.2
870960	10/29/96	2080	2148	4.9	96.8	11/2/96	2318	2489	94.2	6/12/97	2291	2468	94.3
870961	10/31/96	2123	2148	5.2	98.9	11/2/96	2305	2485	92.8	6/16/97	2271	2468	93.5
870962	11/1/96	2115	2148	5.4	98.5	11/2/96	2273	2454	92.6	6/18/97	2290	2468	94.3
870902A										6/20/96	2298	2468	94.6

Notes: 1 - includes 2% correction factor
2 - includes 1.5% correction factor

TABLE 34

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Summary of Bituminous Surface Course Construction Data

Test Section	Paving Date	Binder Type	Haul Distance km	Avg. Load to Unload Time	Time to Pave Test Section	HM Temp		Air Temp and Weather Deg. C	Thickness mm			
						Plant Deg. C	Road Deg. C*		Place Nom.	Compacted		
										Avg.	Max.	Min.
870901	6/9/97	85/100	10	30 min.	65 min.	160	129	25 deg. 10:30 a.m. sunny	80mm	72	86	62
980902	6/10/97	PG 58-40	11	30	85	150	118	25 deg. 11 a.m. hazy, hot	78	59	71	51
870903	6/11/97	PG 58-34	11	30	53	160	137	25 deg. 11 a.m. hazy, hot	85	67	80	59
870960	6/12/97	PG 58-28	12	30	72	150	122	22 deg. 10 a.m. hazy, hot	85	67	80	59
870961	6/16/97	PG 58-34	13	27	65	150	118	18 deg. 10 a.m. hazy, breezy	78	64	73	55
870962	6/17/97	PG 58-40	13	38	65	160	117	10 deg. 9:30 a.m. sun, clouds	78	69	85	59
870902A	6/18/97	PG 58-40	14	60	N/A	150	120	11 deg. 9:30 a.m. cloudy	79			

* Behind Paver

TABLE 35

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Samples for Materials Reference Library (MRL)

Material Description	Containers	Number of Samples	Sample Location
Asphalt Cement	19 L. metal pails 1 per sample	5	Plant
MTO surface course Marshall mix design - combined coarse and fine aggregate	10 - 19 L. plastic pails	1	Plant
Superpave surface course mix design - combined coarse and fine aggregate	10 - 19 L. plastic pails	1	Plant
Pulverized Base	10 - 19 L. plastic pails	1	Road
HMAC Binder Course	12 - 6" x 12" dia. high cylinders	1	Road

TABLE 36

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Pavement Core Log t = 0

Test Section	Coring Date	Paving Date	Core Location	O/S m	LTPP Station	Thickness mm			Remarks
						Binder	Surface	Total	
									155 mm ID
870902	6/19/97	6/10/97	C02	0.6	-57	89	69	158	
			C03	1.1	-55.5	95	70	165	LTPP Lab
			C11	2.4	-57	94	66	160	
			C14	2.4	-52 5	96	64	160	LTPP Lab
			C15	2 4	-51	91	64	154	
			C16	2.4	-49.5	96	64	160	LTPP Lab
			C19	2.4	-45	96	64	160	
			C21	2.4	-42	96	67	163	LTPP Lab
			C24	2.4	+167	80	62	142	
			C25	2.4	168 5	75	61	136	Spare *
			C28	2.4	173	78	62	140	
			C33	2.4	180.5	82	63	145	
			C32	2.4	179	78	64	142	LTPP Lab
			C31	2.4	177.5	82	60	142	LTPP Lab
			C23	2.4	165.5	75	60	135	LTPP Lab
			C07	1.1	168.5	84	61	145	LTPP Lab
			C05	1.1	165.5	82	62	144	Spare
			C06	0.6	167	84	61	145	
870901	6/20/97	6/9/97	C04	0.6	-54	57	71	128	
			C02	0.6	-57	62	70	132	
			C03	1 1	-55.5	61	71	132	
			C01	1.1	-58 5	69	71	140	
			C07	0.6	+169	69	73	142	
			C05	0.6	166	69	75	144	
			C08	1.1	170.5	65	75	140	
			C06	1.1	167.5	70	75	145	

TABLE 36

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Pavement Core Log t = 0

Test Section	Coring Date	Paving Date	Core Location	O/S m	LTPP Station	Thickness mm			Remarks
						Binder	Surface	Total	
870903	6/20/97	6/11/97	C04	0.6	-54	75	58	133	
			C02	0.6	-57	78	60	138	
			C03	1.1	-55.5	76	54	140	
			C01	1.1	-58.5	91	57	148	
			C07	0.6	+169	76	66	142	
			C05	0.6	166	77	67	144	
			C08	1.1	170 5	79	66	145	
			C06	1.1	167.5	82	68	150	
870960	6/20/97	6/12/97	C02	0.6	-57	72	72	144	
			C04	0.6	-54	64	72	136	
			C01	1.1	-58.5	64	71	135	
			C03	1 1	-55.5	63	72	135	
			C07	0.6	+169	61	60	121	
			C05	0.6	166	63	62	125	
			C06	1.1	167.5	63	63	126	
			C08	1.1	170.5	63	62	125	
870961	6/20/97	6/16/96	C04	0.6	-54	63	61	124	
			C02	0.6	-57	60	62	122	
			C03	1.1	-55.5	62	60	122	
			C01	1.1	-58.5	63	60	123	
			C07	0.6	+169	65	60	125	
			C05	0.6	166	64	61	125	
			C06	1.1	167.5	65	59	124	
			C08	1.1	170.5	62	60	122	

TABLE 36

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Pavement Core Log t = 0

Test Section	Coring Date	Paving Date	Core Location	O/S m	LTPP Station	Thickness mm			Remarks
						Binder	Surface	Total	
870962	6/20/97	6/17/97	C02	0.06	-57	63	70	133	
			C04	0 6	-54	65	70	135	
			C01	1 1	-58.5	65	70	135	
			C03	1 1	-55 5	NR	65	N/A	
			C07	0 6	+169	71	66	137	
			C05	0.6	166	62	70	132	
			C06	1 1	167 5	60	70	130	
			C08	1 1	170.5	64	68	132	150 mm ID

Notes: *Cores for 870902 C03, C07, C14, C16, C21, C23, C31 and C32 were taken for the LTPP Contractor Library*

t = 0 cores for 870902 C01, C08, C10, C13, C17, C18, C20, C27, C29, C34, C04, C30, C12, C22, C09 and C26 for the Superpave Regional Test Center were not to be taken until advised

A 6 1" (155mm) core barrel was used throughout except for the last core C08 of 870962 which used a 150mm ID core bit

Sections 870902 and 870962 with PG 58-40 AC were difficult to core because the polymer plugged the bit

The core drill was mounted on a 1/2 T pick-up truck and it was sometime difficult to obtain a core perpendicular to the pavement surface

TABLE 37

Ontario SPS-9A, Project 870900, Hwy 17 WB, PETAWAWA, ON
Comparison of Binder Course Thickness by 5 Point Levels and Cores
and of Compaction by Nuclear Density Tests and Cores

	Thickness mm								Compaction %	
Test Section	5 Pt. Levels 55 Pts. 1996	Avg. of Cores (C) 1m Outside of TS May 1997		Line at 0+00 5 Pts.	Avg. of Cores (C) at 0-1m		Line at 152+00 5 Pts.	Avg. of Cores (C) at 152+1m		Nucl. Dens. Avg. of 3 Oct/Nov 1996	4" Cores Ave. of 3 - 1m Before or After TS
870901	79	77	4C	78	77	2C	91	77	2C	92.8	95.4 After
870902	91	87	4C	88	92	2C	95	82	2C	91	94.8 Before
870903	76	80	3C	75	81	2C	81	76	1C	90.9	92.1 After
870960	63	70	5C	68	74	3C	58	62	2C	94.2	94.5 After
870961	63	67	4C	66	72	2C	59	63	2C	92 8	94.0 After
870962	65	72	4C	69	72	2C	61	72	2C	92 6	97.4 Before

FIGURES

1-12

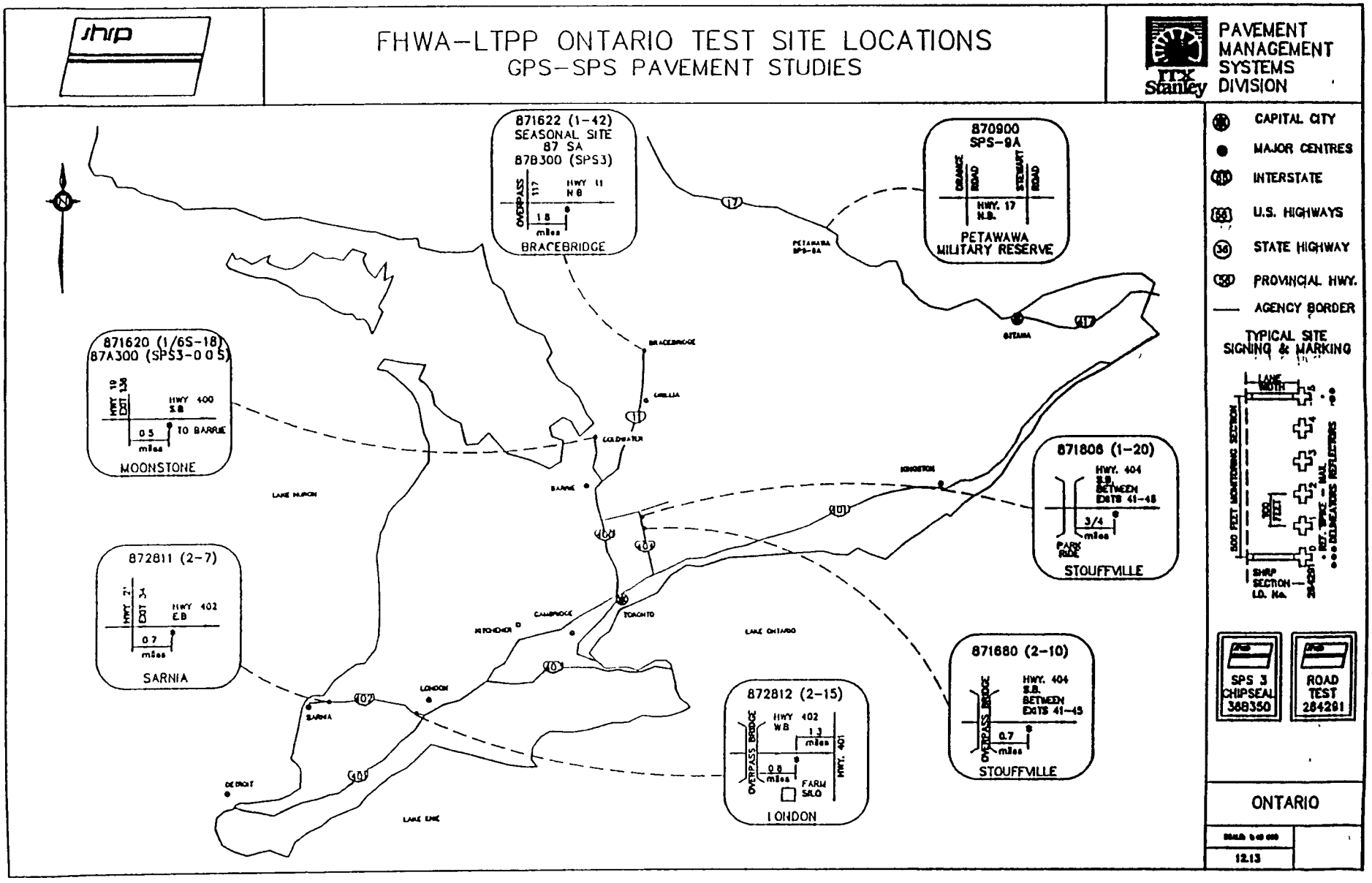
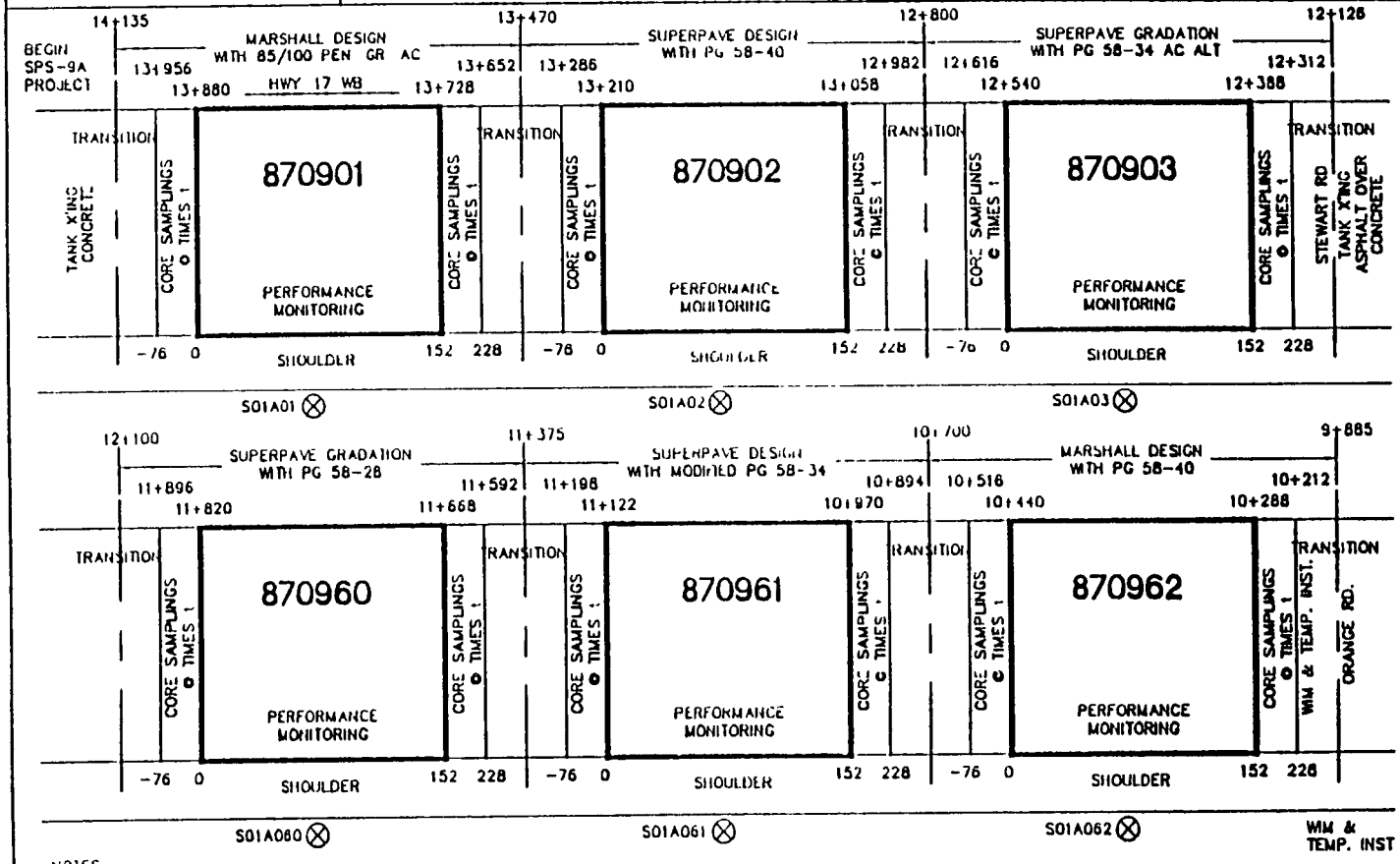

FHWA-LTPP ONTARIO TEST SITE LOCATIONS
GPS-SPS PAVEMENT STUDIES
PAVEMENT MANAGEMENT SYSTEMS DIVISION
ITS Stanley
871622 (1-42)
SEASONAL SITE
87 SA
878300 (SPS3)
BRACEBRIDGE
870900
SPS-9A
PETAWAWA MILITARY RESERVE
871620 (1/6S-18)
87A300 (SPS3-005)
MOONSTONE
871806 (1-20)
STOUFFVILLE
872811 (2-7)
SARNIA
872812 (2-15)
LONDON
871680 (2-10)
STOUFFVILLE
CAPITAL CITY
MAJOR CENTRES
INTERSTATE
U.S. HIGHWAYS
STATE HIGHWAY
PROVINCIAL HWY.
AGENCY BORDER
TYPICAL SITE SIGNING & MARKING
SPS 3 CHIPSEAL 368350
ROAD TEST 284281
ONTARIO
12.13

FIGURE 1

FHWA–LTPP SPS 9A PETAWAWA ON DESIGN SCHEMATIC

VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

PAVEMENT MANAGEMENT SYSTEMS DIVISION



NOTES

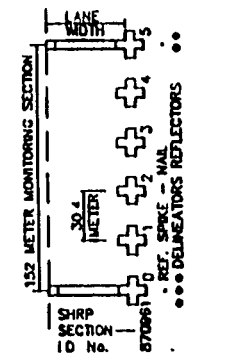
* POLYMER MODIFICATION OF THE A/C IN 870961 AND/OR 870962 IS A CONTRACTOR/SUPPLIER OPTION

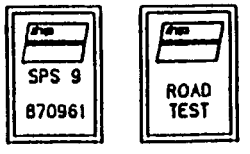
† 152mm DIAMETER CORES SAMPLED © TIMES

⊗ SHOULDER PROBES TO 6m (S1–S6)

A = 0, IMMEDIATELY AFTER CONSTRUCTION
B = 6 MONTHS AFTER CONSTRUCTION
C = 12 MONTHS AFTER CONSTRUCTION
D = 18 MONTHS AFTER CONSTRUCTION
E = 24 MONTHS AFTER CONSTRUCTION
F = 48 MONTHS AFTER CONSTRUCTION

TYPICAL SITE SIGNING & MARKING





MARSHALL + SUPERPAVE ASPHALT MIXES WITH PENETRATION AND PG ASPHALT CEMENTS

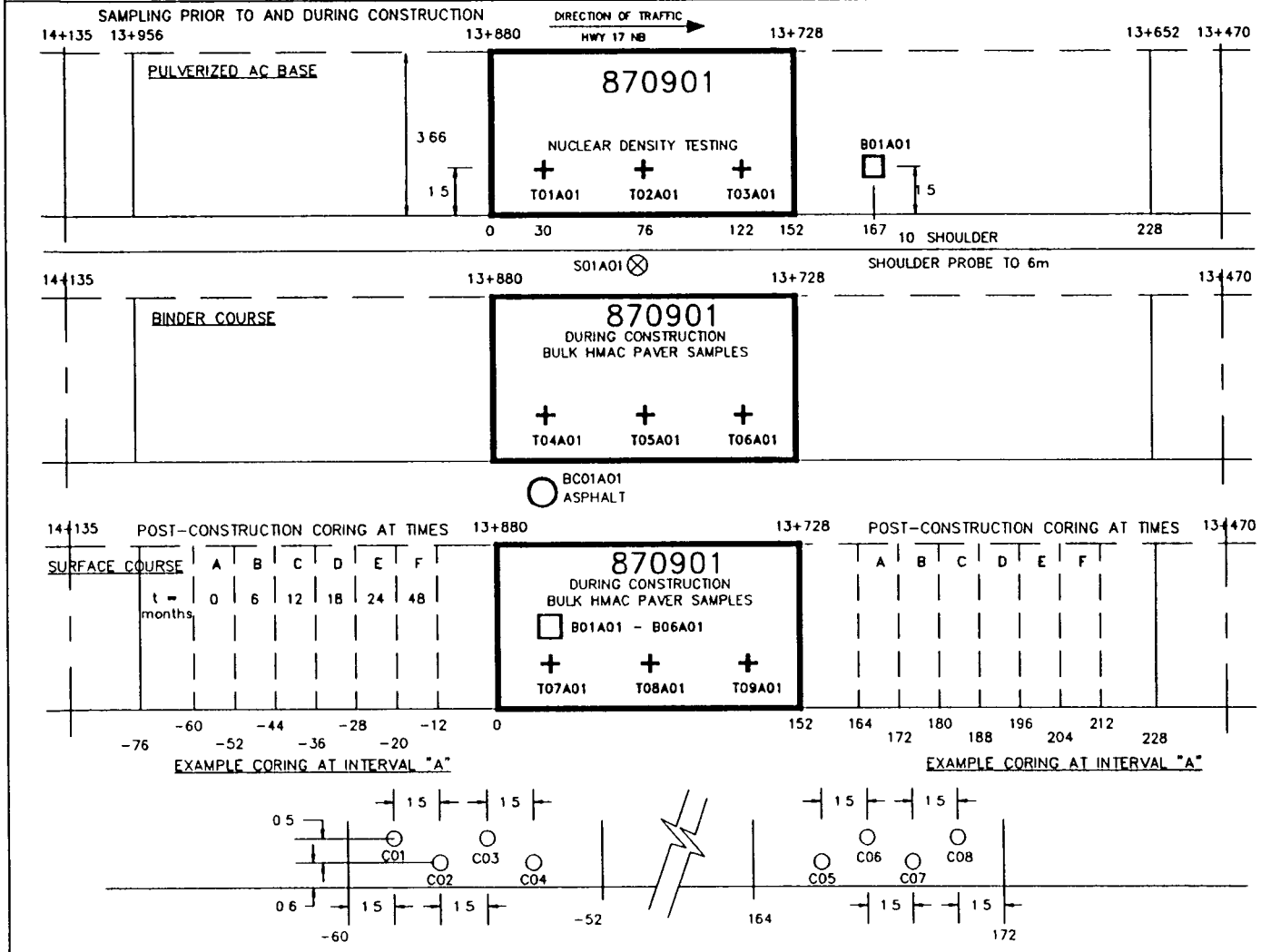
MTO ON. SPS-9A, HWY 17 WB, PETAWAWA, ON.

SPS-9A-02

FIGURE 2-MTO ON. SPS-9A, HWY. 17 WB, PETAWAWA, ON.-TEST SECTION LAYOUT

FHWA–LTPP SPS 9A PETAWAWA ON DESIGN SCHEMATIC
VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

PAVEMENT MANAGEMENT SYSTEMS DIVISION
ITX Stanley



PRIOR TO PAVING

- BULK SAMPLE LOCATIONS B01A01 FOR SUBGRADE– BS01A01 PULVERIZED AC– BG01A01 GRANULAR SUBBASE BG02A01
- NUCLEAR DENSITY TESTS T01A01–T03A01
- SHOULDER AUGER PROBE TO 6m S01A01

DURING PAVING

- BULK PAVER SAMPLES SURFACE COURSE–BA01A01–BA06A01
- NUCLEAR DENSITY TESTS BINDER– T04A01–T06A01 SURFACE– T07A01–T09A01
- ASPHALT CEMENT PLANT SAMPLE BC01A01

POST CONSTRUCTION

- 152mm CORE SPECIMEN CA01A01–CA08A01 CA01B01–CA08B01 CA01C01–CA08C01 CA01D01–CA08D01 CA01E01–CD08E01 CA01F01–CA08F01

SPS 9
240961

ROAD TEST

MARSHALL DESIGN WITH PG 58–40

MTO ON SPS–9A HWY 17 NB PETAWAWA, ON

PLOTDATE APRIL 1/98

SPS–9A–03

FHWA SPS–9A TEST SECTIONS ONLY DIMENSIONAL DETAILS ONLY DRAWING NOT TO SCALE

FIGURE 3–MATERIALS SAMPLING AND TESTING PLAN SPS–9A SECTION 870901

FHWA–LTPP SPS 9A PETAWAWA ON DESIGN SCHEMATIC

VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

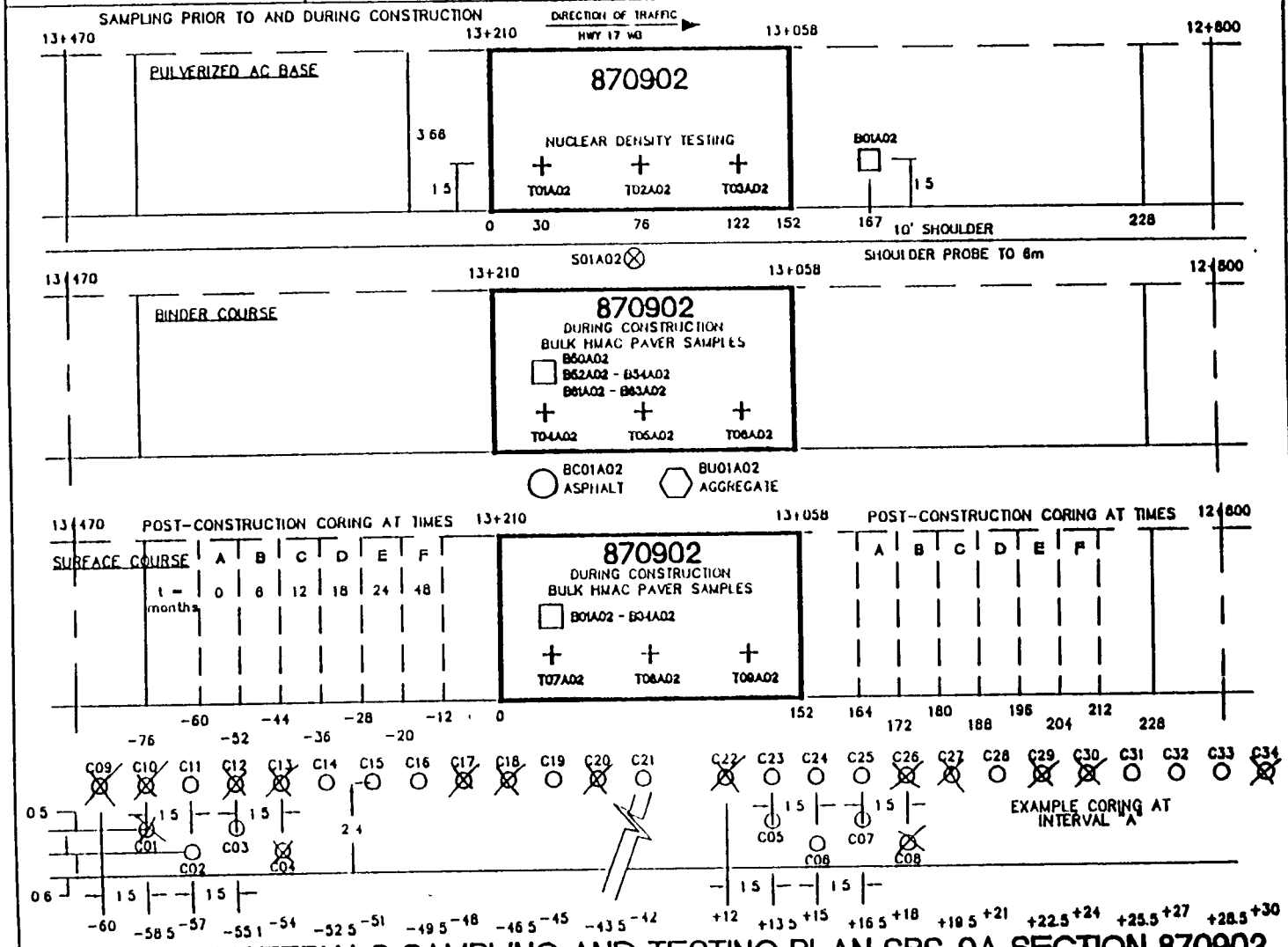


FIGURE 4-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 870902

PAVEMENT MANAGEMENT SYSTEMS DIVISION

PRIOR TO PAVING

- BULK SAMPLE LOCATIONS B01A02
  FOR SUBGRADE– BS01A02
  PULVERIZED AC– BG01A02
- \+ NUCLEAR DENSITY TESTS T01A02–T03A02
- ⊗ SHOULDER AUGER PROBE TO 6m S01A02

DURING PAVING

- BULK PAVER SAMPLES
  BINDER COURSE–BA50A02
  –BA52A02–BA54A02
  –BA81A02–BA83A02
  SURFACE COURSE–BA01A02–BA34A02
- \+ NUCLEAR DENSITY TESTS
  BINDER– T04A02–T06A02
  SURFACE– T07A02–T09A02
- ○ ASPHALT CEMENT PLANT SAMPLE BC01A02
- ⬡ COMBINED AGGREGATE PLANT SAMPLE BU01A02

POST CONSTRUCTION

- ○ 152mm CORE SPECIMEN
  CA01A02–CA34A02 ⊗ DO NOT TAKE UNTIL ADVISED
  CA01B02–CA08B02
  CA01C02–CA08C02
  CA01D02–CA08D02
  CA01E02–CA08E02
  CA01F02–CA08F02

SPS 9
240981

ROAD TEST

SUPERPAVE WITH PG 58-40

MTO ON. SPS–9A HWY 17 WB
PETAWAWA, ON.

SPS–9A–04

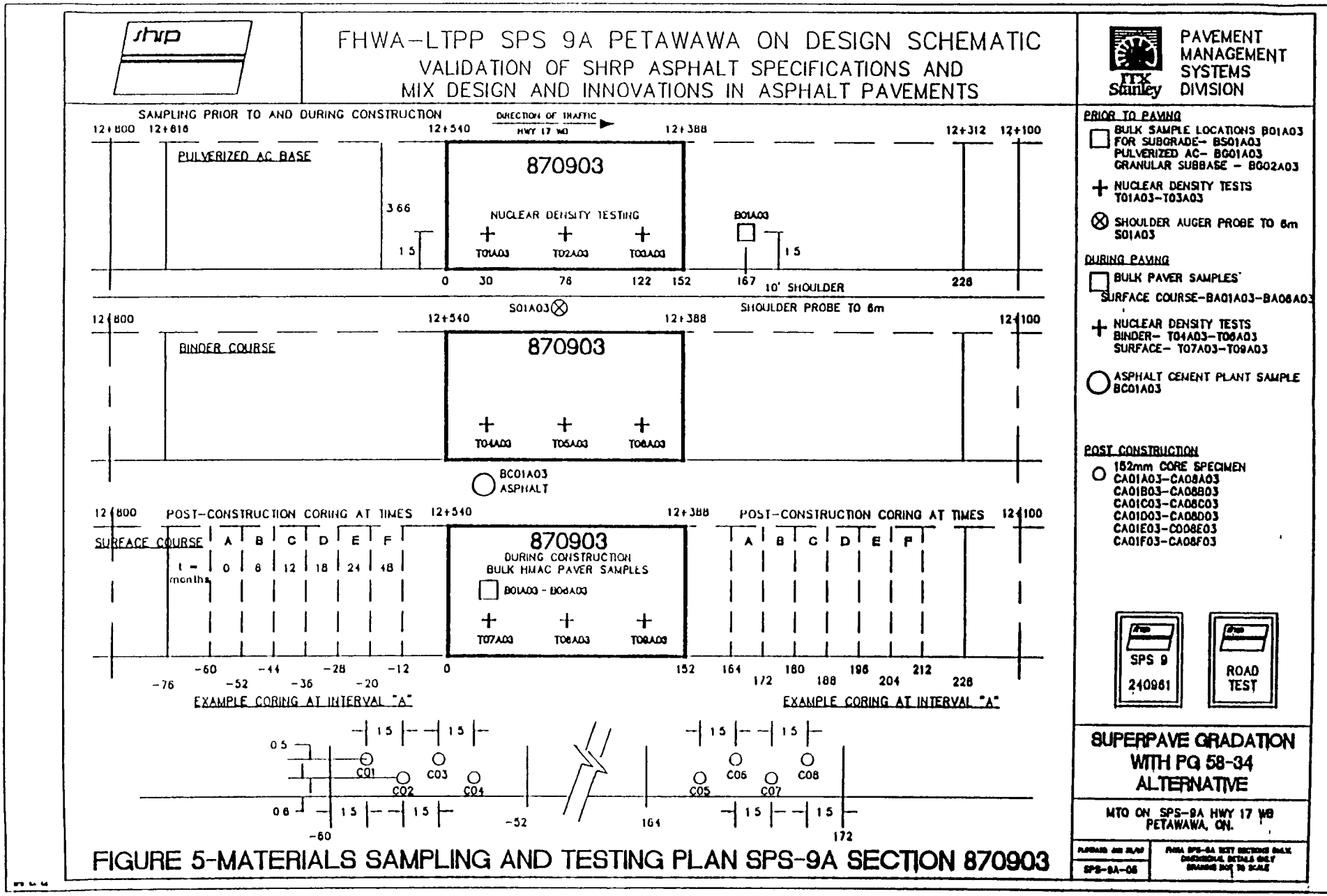
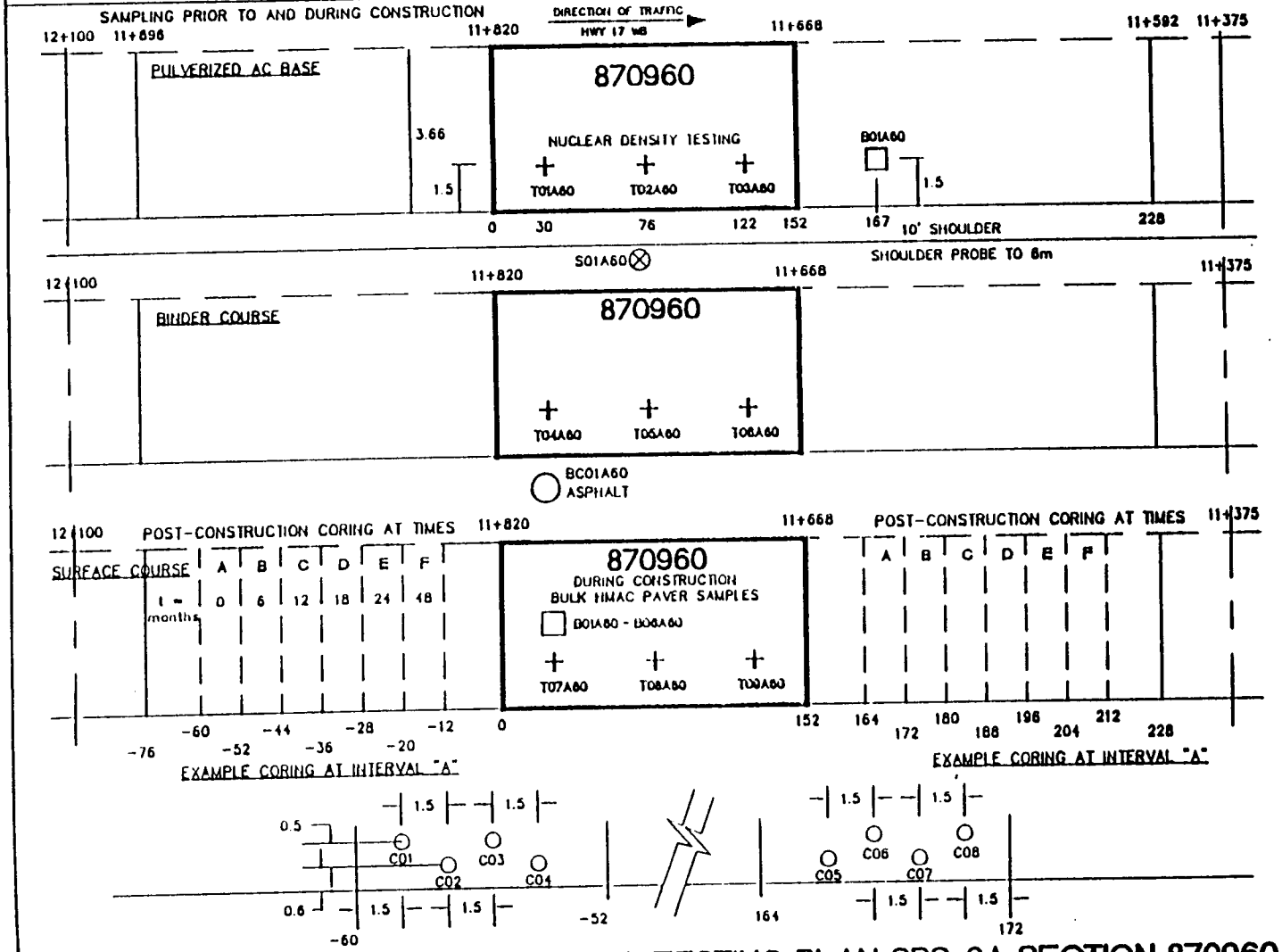


FIGURE 5-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 870903

FHWA–LTPP SPS 9A PETAWAWA ON DESIGN SCHEMATIC

VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

PAVEMENT MANAGEMENT SYSTEMS DIVISION



PRIOR TO PAVING

- BULK SAMPLE LOCATIONS B01A60 FOR SUBGRADE– BS01A60 PULVERIZED AC– BG01A60
- NUCLEAR DENSITY TESTS T01A60–T03A60
- SHOULDER AUGER PROBE TO 6m S01A60

DURING PAVING

- BULK PAVER SAMPLES SURFACE COURSE–BA01A60–BA06A60
- NUCLEAR DENSITY TESTS BINDER– T04A60–T06A60 SURFACE– T07A60–T09A60
- ASPHALT CEMENT PLANT SAMPLE BC01A60

POST CONSTRUCTION

- 152mm CORE SPECIMEN CA01A60–CA08A60 CA01B60–CA08B60 CA01C60–CA08C60 CA01D60–CA08D60 CA01E60–CD08E60 CA01F60–CA08F60

SPS 9 240961

ROAD TEST

SUPERPAVE GRADATION WITH PG 58-28

MTO ON. SPS–9A HWY 17 WB PETAWAWA, ON.

SPS-9A-06

FIGURE 6-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 870960

FHWA–LTPP SPS 9A PETAWAWA ON DESIGN SCHEMATIC

VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

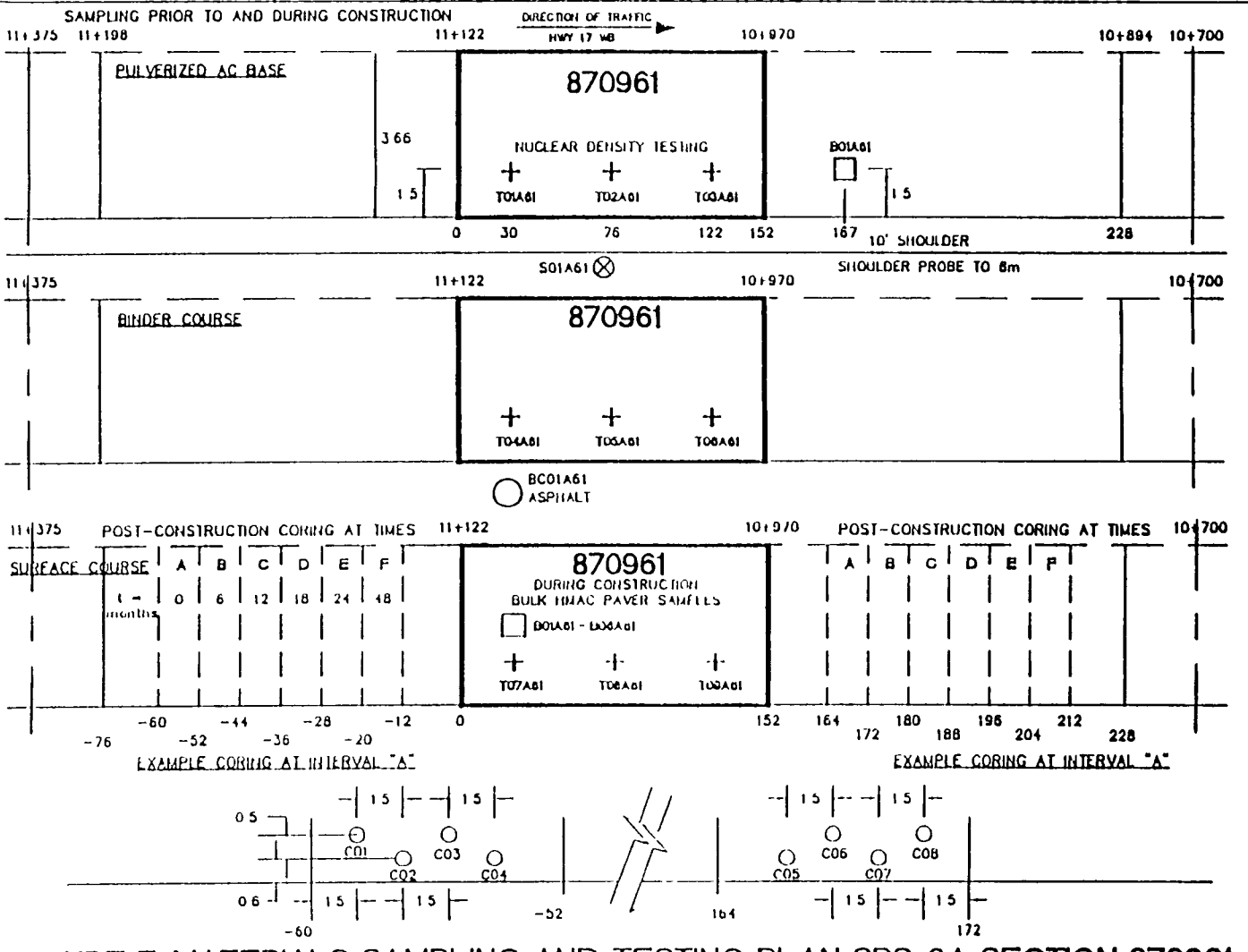


FIGURE 7-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 870961

ITX Stanley PAVEMENT MANAGEMENT SYSTEMS DIVISION

PRIOR TO PAVING

- BULK SAMPLE LOCATIONS B01A61 FOR SUBGRADE– BS01A61 PULVERIZED AC– BG01A61
- NUCLEAR DENSITY TESTS T01A61–T03A61
- SHOULDER AUGER PROBE TO 6m S01A61

DURING PAVING

- BULK PAVER SAMPLES SURFACE COURSE–BA01A61–BA06A61
- NUCLEAR DENSITY TESTS BINDER– T04A61–T06A61 SURFACE– T07A61–T09A61
- ASPHALT CEMENT PLANT SAMPLE BC01A61

POST CONSTRUCTION

- 152mm CORE SPECIMEN CA01A61–CA08A61 CA01B61–CA08B61 CA01C61–CA08C61 CA01D61–CA08D61 CA01E61–CD08E61 CA01F61–CA08F61

SPS 9 240961

ROAD TEST

SUPERPAVE WITH MODIFIED PG 58-34

MTO ON SPS-9A HWY 17 WB PETAWAWA, ON.

SPS-9A-07

FHWA–LTPP SPS 9A PETAWAWA ON. DESIGN SCHEMATIC

VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

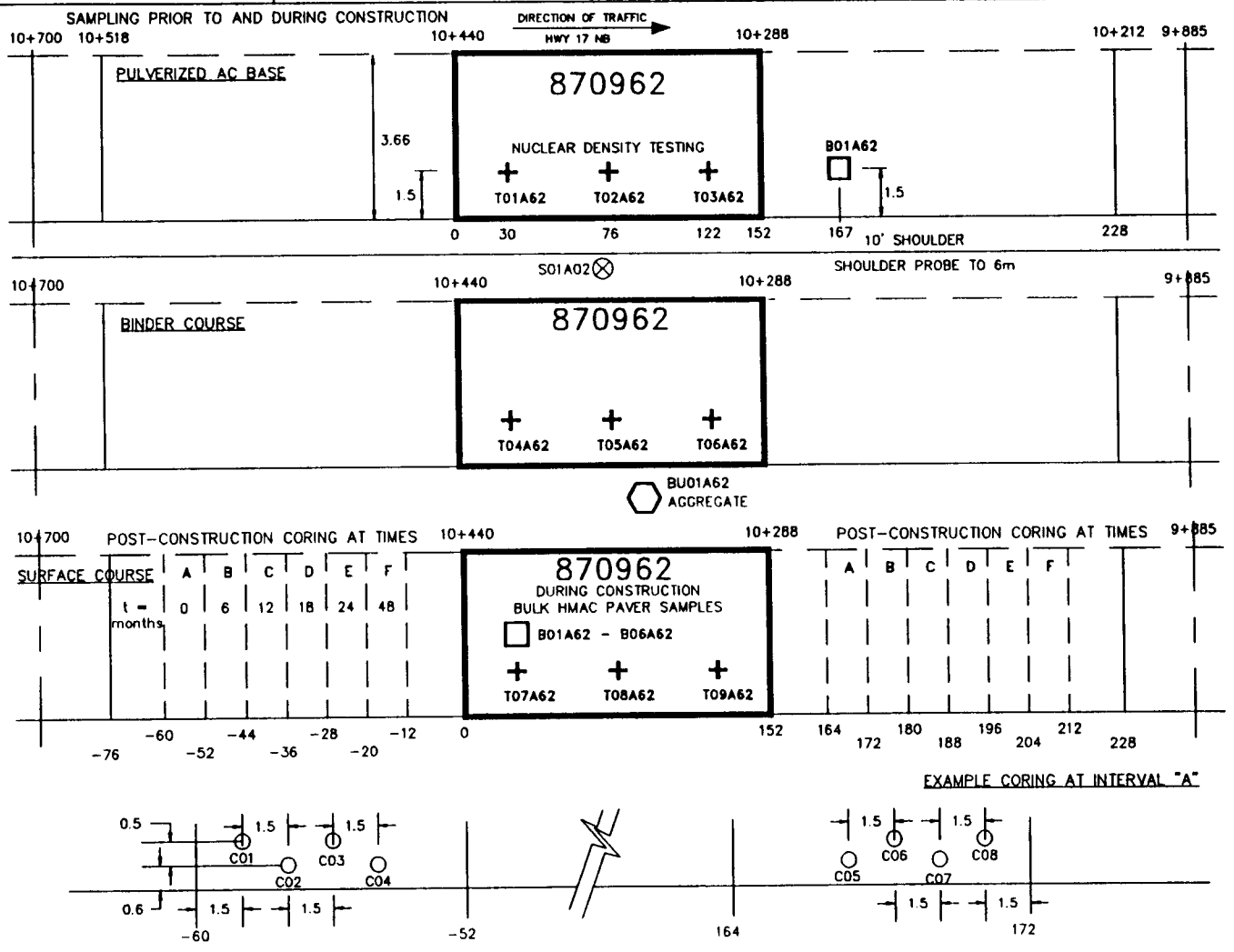


FIGURE 8-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 870962

PAVEMENT MANAGEMENT SYSTEMS DIVISION

ITT Stanley

PRIOR TO PAVING

- BULK SAMPLE LOCATIONS B01A62
  FOR SUBGRADE– BS01A62
  PULVERIZED AC– BG01A62
- \+ NUCLEAR DENSITY TESTS
  T01A62–T03A62
- ⊗ SHOULDER AUGER PROBE TO 6m
  S01A62

DURING PAVING

- BULK PAVER SAMPLES
  SURFACE COURSE–BA01A62–BA06A62
- \+ NUCLEAR DENSITY TESTS
  BINDER– T04A02–T06A02
  SURFACE– T07A62–T09A62
- ⬡ COMBINED AGGREGATE PLANT SAMPLE BU01A62

POST CONSTRUCTION

- ○ 152mm CORE SPECIMEN
  CA01A62–CA34A62
  CA01B62–CA08B62
  CA01C62–CA08C62
  CA01D62–CA08D62
  CA01E62–CD08E62
  CA01F62–CA08F62

SPS 9 240961

ROAD TEST

MARSHALL DESIGN WITH PG 58–40

MTO ON. SPS–9A HWY 17 NB
PETAWAWA, ON.

PLOTDATE: APRIL 1/98

SPS–9A–06

FHWA SPS–9A TEST SECTIONS ONLY.
DIMENSIONAL DETAILS ONLY
DRAWING NOT TO SCALE

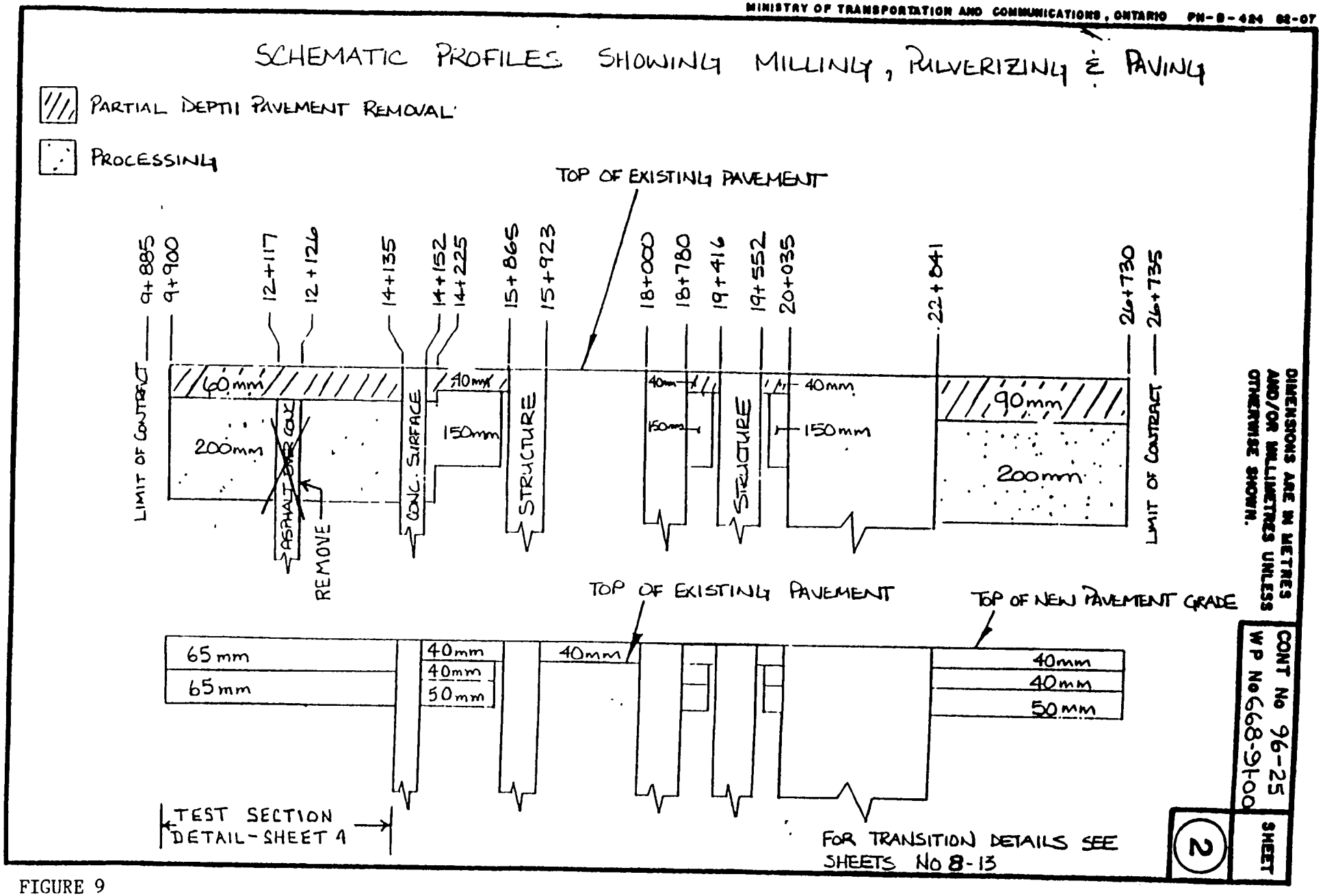
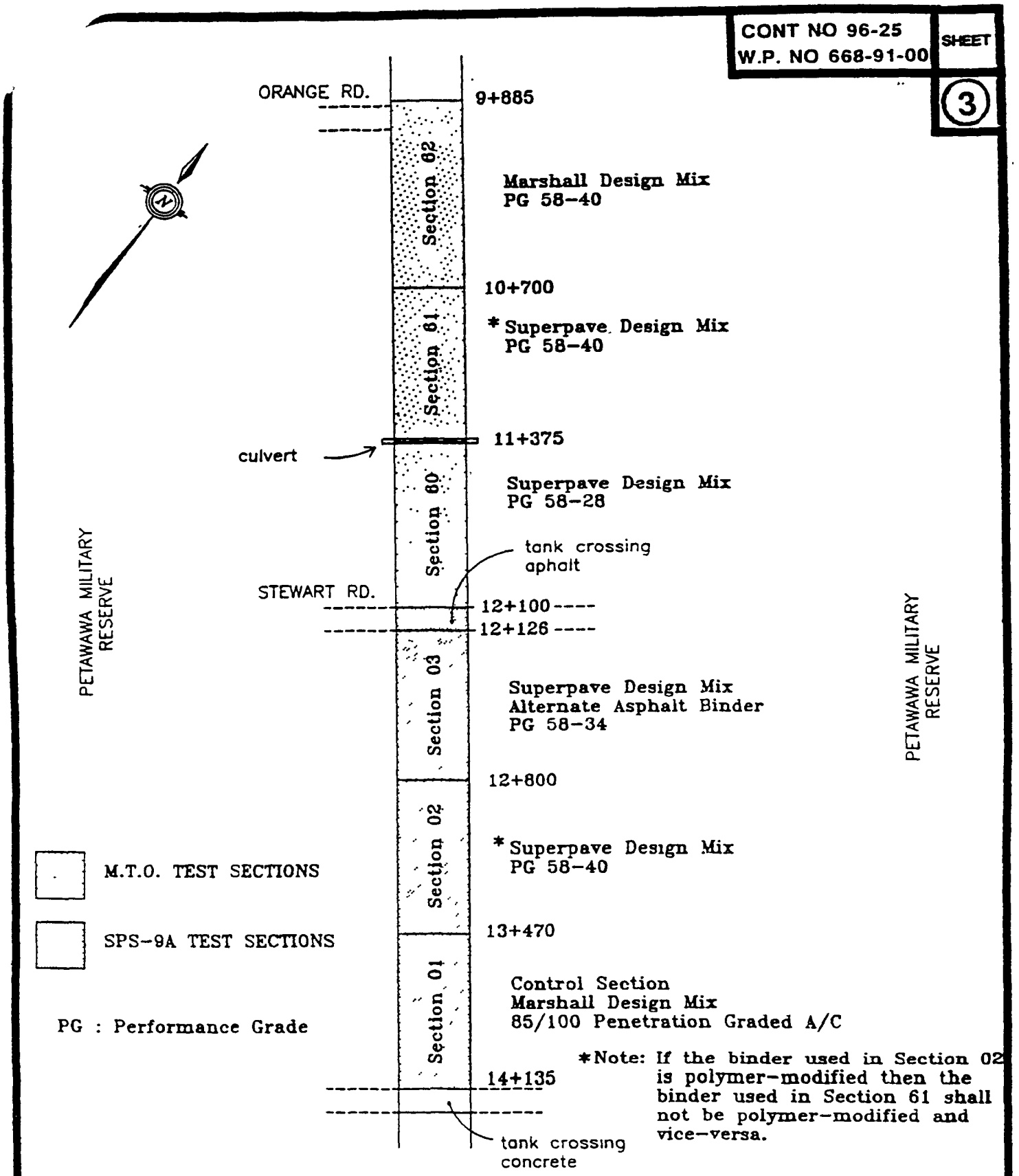

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO PH-B-424 82-07
SCHEMATIC PROFILES SHOWING MILLING, PULVERIZING & PAVING
PARTIAL DEPTH PAVEMENT REMOVAL
PROCESSING
TOP OF EXISTING PAVEMENT
LIMIT OF CONTRACT
9+885
9+900
12+117
12+126
14+135
14+152
14+225
15+865
15+923
18+000
18+780
19+416
19+552
20+035
22+841
26+730
26+735
LIMIT OF CONTRACT
60mm
200mm
ASPHALT BARRIER CURB
REMOVE
CONC. SURFACE
40mm
150mm
STRUCTURE
40mm
150mm
STRUCTURE
40mm
150mm
90mm
200mm
TOP OF EXISTING PAVEMENT
TOP OF NEW PAVEMENT GRADE
65mm
65mm
40mm
40mm
50mm
40mm
40mm
40mm
50mm
TEST SECTION
DETAIL - SHEET 4
FOR TRANSITION DETAILS SEE
SHEETS No 8-13
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES UNLESS
OTHERWISE SHOWN.
CONT No 96-25
WP No 668-9400
SHEET
2

FIGURE 9



General Layout

SPS-9A Trials, Highway 17N, Petawawa, Ontario

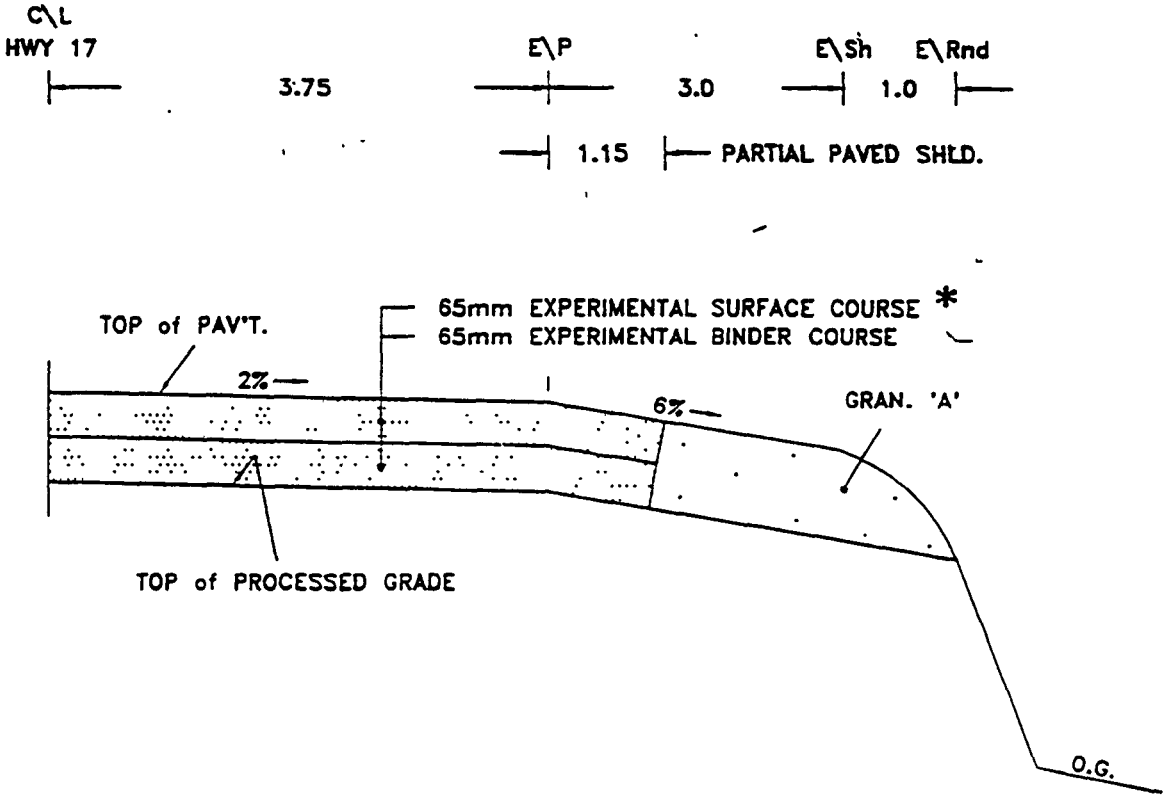
Paving Typical - Sheet 4

N.T.S.

FIGURE 10

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No 96-25
WP No 668-91-00
SHEET 4



* Sta. 9+885 – 10+700 — 65mm H.L.3 Modified Surface Course
65mm H.L.4 Binder Course

Sta. 10+700 – 13+470 — 65mm Superpave Surface Course
65mm Superpave Binder Course

Sta. 13+470 – 14+135 — 65mm H.L.3 Modified Surface Course
65mm H.L.4 Binder Course

TYPICAL TEST SECTION PAVING

Sta. 9+885 to 14+135

FIGURE 11

N.T.S.

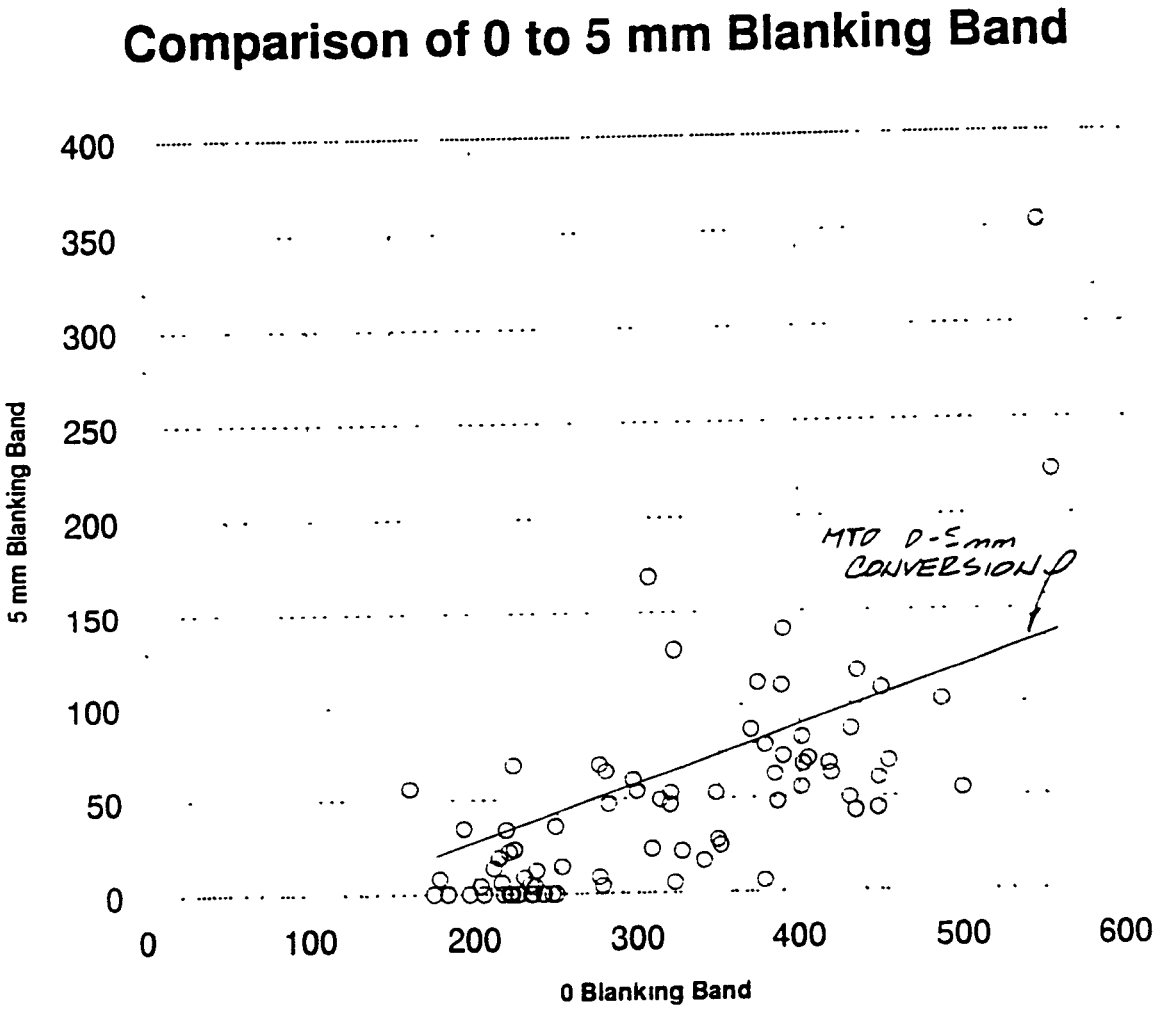

Comparison of 0 to 5 mm Blanking Band
5 mm Blanking Band
0 Blanking Band
400
350
300
250
200
150
100
50
0
0
100
200
300
400
500
600
MTO 0-5mm
CONVERSION

FIGURE 12

APPENDIX A

QUALITY CONTROL PLAN

SMITH CONSTRUCTION

ARNPRIOR

Quality Control Plan

Smiths Construction Company Arnprior Limited

Smiths Construction Company Amprior Limited has been engaged in the construction of asphalt pavements and related road works since 1961. Smiths operates 3 asphalt plants in Ontario. For further details on the company and their quality control program please see the attached summary. As per the special provisions we should like to present our proposed plan and in the same format as indicated in the contract.

a) GRADE PREPARATION

The contract calls for pulverizing the existing asphalt pavement and reshaping and compacting the grade so that it is suitable for paving. Samples shall be taken and tested as described in the special provisions. In place density measurements shall be taken and recorded. Additionally a nuclear gauge will be used to test the Monitoring Portion of each test section as specified in Table H of the special provisions.

b) AGGREGATE QUALITY

The quality of the aggregates will be monitored on an ongoing basis. Coarse aggregate to be incorporated in the hot mix will be tested to ensure compliance with the coarse aggregate requirements of Table on page 82 and Table B on page 94 of the contract document. During coarse aggregate production/stockpiling one sample of each coarse aggregate type will be obtained every 2000 tonnes and will be subjected to Gradation, Percent Crushed, and Percent passing 0.075 mm sieve tests. For each fine aggregate type samples will be obtained every 2000 tonnes and tested for gradation. The sampling and testing frequency is summarized on the attached ***Sampling and Testing Frequency Table***.

Stockpile Management

The aggregates will be stored on a clean surface with different sizes coarse and fine aggregates kept separated. Care will be exercised both during the stockpiling process and during the removal process to minimize segregation of the aggregate in each stockpile.

c) ASPHALT BINDER

Samples of asphalt binders will be obtained upon delivery of each load and from the feed line to the plant for every 1000 tonnes of HMA with one per day of production as minimum. The 85/100 pen binder samples will be tested for penetration and viscosity at DBA laboratories. In addition recovered penetration testing will be carried out in DBA laboratories for every 5000 tonnes of HMA.

The testing of performance graded binders will be carried out by Advanced Asphalt Technologies, LP, Sterling, VA. Documentation of laboratory's participation and proficiency in the AASHTO Materials Reference Laboratory proficiency correlation program is available.

In addition to the above, our supplier, McAsphalt Industries will be testing all asphalt binder shipped to the contract at their ISO 9003 approved facility These tests would be available prior to shipping the product.

d) ANTI-STRIP ADDITIVES

The need of the anti-stripping additives will be determined at the mix design stage. The need and required amount of anti-stripping additive will be based on the AASHTO test method T283. It should be noted that all aggregates for this contract except for any blending materials will come from Pit #9 as shown on the ASL. This calls for the use of an anti-stripping additive for aggregates from this source.

e) ASPHALT MIXTURE DESIGN

The following 10 mix designs will be completed in DBA laboratories.

Mix Type	Binder Type	Mix Design Method
HL4 Binder	85/100 Pen.	Marshall
HL3 Mod. Surface	85/100 Pen.	Marshall
19 mm Binder	PG 58-40	SUPERPAVE
12.5 m Surface	PG 58-40	SUPERPAVE
19 mm Binder	PG 58-34	SUPERPAVE
12.5 m Surface	PG 58-34	SUPERPAVE
19 mm Binder	PG 58-28	SUPERPAVE
12.5 m Surface	PG 58-28	SUPERPAVE
HL4 Binder	PG 58-40	Marshall
HL3 Mod. Surface	PG 58-40	Marshall

DBA is a CCIL Type A, B and E certified laboratory and is equipped with SUPERPAVE Gyratory Compactor. DBA staff have been trained in the SUPERPAVE mix design method.

f) MIX PRODUCTION

All asphaltic mixtures will be produced in a stationary 5,000 lb batch plant capable of operating at a nominal capacity of 150 tonnes per hour. It will meet all of the requirements of OPSS 1149 together with the amendments specified in the special provisions. Sufficient asphalt binder storage capacity will be available so that no cross-contamination of the asphalt binder types occurs. The plant is operated by personnel with more than 10 years of experience on asphalt plants.

g) PLACING AND FINISHING INCLUDING TEXTURAL REQUIREMENTS AND JOINT CONSTRUCTION

Placing of the asphalt mixtures will be done with a paver equipped with a vibratory screed and extensions that allow paving from 3 meters to 5 meters in width. The compaction equipment that will be utilized consists of a double drum vibratory asphalt roller and an 18 tonne pneumatic tired roller. Spare rollers will be available on site in the event of a malfunction of one of the rollers. In

order to satisfy the special provisions for continuous mix placement within the test sections, a material transfer device (MTD) and more specifically an MTV model 2500 manufactured by Astec would be used to continuously feed material to the paver to ensure a continuous placing operation.

The use of the MTV will also ensure that smoothness on the contract can be achieved. On prior contracts with the MTO where the MTV was used the current smoothness specifications would have been met with no penalties.

The paving crew have had many years experience in placing hot mix asphalts and are aware of proper joint construction techniques, particularly longitudinal joints where the correct amount of over-lap is required to produce durable joints.

h) COMPACTION

Compaction determinations will be made on each day of HMA production. The testing will be done with nuclear gauges using mean Maximum Relative Density values. The test data will be used to determine the compaction equipment required, establish rolling patterns and determine the achieved compaction. A correlation will be established between nuclear gauge and pavement core densities during compaction trial at control strips.

The nuclear gauge testing will be performed by DBA staff trained in the safe operation, transportation and handling of nuclear gauges.

i) PAVEMENT SMOOTHNESS

The pavement smoothness measurements will be made by using a Profile Measuring Device (PMD). The measurements will be made by DBA with their CS8200 California Type Profilograph.. This PMD is capable of producing a hard copy of the continuous profile trace and is programmed to read in metric units with rate of roughness rounded to the nearest 0.1 mm/km. Prior to using on this contract the PMD will be correlated with MTO's McCracken California Profilograph..

j) SAMPLING AND TESTING AS MANDATED

DBA's on site laboratory will carry out testing of HMA during production. Samples will be obtained for each 500 tonnes of produced HMA with a minimum of one for each day of production. The obtained samples will be tested for asphalt binder content, gradation and volumetric properties.

In addition testing of aggregates and asphalt binders will be carried out as noted above. The sampling and testing frequency is summarized on the attached ***Sampling and Testing Frequency Table.***

To ensure that all material being produced has an equal chance of being sampled and tested, the sampling will be carried out in accordance with "Standard Practice for Random Sampling of Construction Materials", ASTM designation D3665.

k) ELEVATION SURVEY REFERENCING SYSTEM

A qualified Engineering company will be retained to perform an elevation survey as specified in the special provisions. Care will be taken to ensure that for each test section in the Monitoring Portion a referencing system is established as specified.

Plan Administrator

Bruce Kenny, a full time employee of Smiths will act as the plan administrator for Contract 96-25. He will have full authority to institute any and all actions necessary for the successful operation of the Plan. He will be able to report to the job site within one hour after being notified of a problem. Curriculum Vitae of Bruce Kenny is attached. He will be reporting directly to our Quality Control Manager, Allen Smith.

Process Control Technician

Mr. Jeremy DeMello will act as full time Process Control Technician for Contract 96-25. In his role as the Process Control Technician Mr. DeMello will utilize laboratory test results and other quality control practices to assure the quality of aggregates and other hot mix components and adjust and control mix proportioning to meet the mix design requirements. He will also periodically inspect all equipment utilized in proportioning and mixing to assure all equipment is in proper operating condition. Mr. DeMello has over five years of experience in the laboratory testing of asphaltic concrete and asphalt cements, asphalt plant process control, quarry aggregate process control, quality assurance and reporting. Typical project experience includes construction of highways, roads, etc. Curriculum Vitae of Mr. DeMello is attached.

Quality Control Technician

Herb Villneff from the Miller Group will act as full time Quality Control Technician for Contract 96-25. He will periodically inspect all equipment utilized in placing, finishing, and compacting hot mix to ensure they are in proper operating condition and to ensure that placing, finishing, joint construction, and compaction are in conformance with the specifications.

Quality Control Laboratory

Laboratory testing to applicable standards and test methods will be carried out in a. mobile laboratory situated at the asphalt plant location. The mobile laboratory will be operated by the staff of DBA Engineering Ltd. ("DBA") A list of the type and quantity of laboratory equipment is attached. The mobile laboratory has direct corporate affiliation with DBA. DBA operates a CCIL certified Type A, B and E laboratory at its head office location in Markham, Ontario. In addition DBA has two CCIL certified Type B mobile laboratories.

TABLE

QUALITY CONTROL PLAN, MTO CONTRACT 96-25

SAMPLING AND TESTING FREQUENCY

Material Type	Frequency	Tests To Be Carried Out	Test Methods
Asphalt Binders			
85/100 Pen.	1 per 1000 tonnes min. 1 per day	Standard Penetration Kinematic Viscosity	MTO LS-200 AASHTO T201
Performance Graded	1 per 1000 tonnes min. 1 per day	Binder Grade Verification without direct tension test	AASHTO PP6
Aggregates (during production/ stockpiling)			
Coarse aggregate	1 per 2000 tonnes	Gradation Percent Crushed Percent Passing 0.075 mm sieve	AASHTO T27 MTO LS-607 AASHTO T11
Fine Aggregate	1 per 2000 tonnes	Gradation	AASHTO T27
Aggregates (during HMA production/)			
Coarse aggregate	1 per day	Gradation Moisture Content	AASHTO T27 ---
Fine Aggregate	1 per day	Gradation Moisture Content	AASHTO T27 ---
Fine Aggregate	1 per 5000 tonnes HMA	Sand Equivalent	ASTM D2419
Asphalt Hot Mix	1 per 500 tonnes	Asphalt Binder Content & Gradation Volumetric Properties	AASHTO T165 AASHTO T166, TP4
	1 per 5000 tonnes	Recovered Penetration	MTO LS-284

smiths
ARNPRIOR

SMITHS CONSTRUCTION COMPANY ARNPRIOR LIMITED

BOX 218 · 276 MADAWASKA BLVD. · ARNPRIOR, ONTARIO K7S 3H4
PHONE (613) 623-3144 · 1-800-267-7387 · FAX (613) 623-8769

June 12, 1996.
Arnprior, Ontario.

SMITHS CONSTRUCTION COMPANY ARNPRIOR LIMITED - A RESUME

Smiths Construction Company Arnprior Limited has been involved in the production and laying of Hot Mix Asphaltic Concrete since 1961 when the Company purchased its first plant - a Cedar Rapids 5000 lb. batch plant. In the intervening years the Company acquired a 5000 lb. Pioneer batch plant and finally a C.M.I. Drum Plant rated at 300 t.p.h. to become one of the first in the Province to be involved in full depth asphalt removal and recycling.

For many years, Smiths have been strong supporters of the Ontario Road Builders' Association and have sent representatives to participate in many of the siminars sponsored by O.R.B.A. and M.T.O. to expand and upgrade the knowledge and expertise of our field staff.

Smiths take pride in maintaining their equipment to a high standard and taking advantage of innovation, refer to the attached letter which indicates the solid relationship we have built and maintained with M.T.O. over many years. This relationship was most evident and helpful during some of the experimental projects we participated in. These included, at various times, the introduction of rubber, asbestos, sulpher, polymer, and verglimit, some of which required considerable ingenuity and co-operation between contractor and owner.

Following is a list of some of the paving contracts completed by Smiths in recent years -

1. Cont. 95-10 - Hwy. 15 - Almonte-Lanark	H.L.4.	12672t
	Recycl. H.M. 30/70	24713t
2. Cont. 94-75 - Hwy. 17 - Cobden E'ly	H.L.1	15931t
	Medium Duty Binder	24725t

...2

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3.	Cont. 94-26 - Hwy. 17 - Cobden	H.L. 3 Mod.		3116t
		H.L. 4		5430t
4.	Cont. 40-94-07 - Hwy. 653 - Chenaux - Hwy. 17	H.L. 4		6166t
5.	Cont. 40-94-06 - Hwy. 60 - Golden Lake-Eganville	H.L. 4		20691t
6.	Cont. 10-94-31 - Hwy. 60 - Wilno-Killaloe	Recycl. H.M. 40/60		19486t
7.	Cont. 93-58 - Hwy. 17 - Deux-River-Chalk River	H.L. 4		11131t
8.	Cont. 93-29 - Hwy. 17,60 - Arnprior-Renfrew	H.L. 1		28396t
		Med. Duty Binder		42282t
9.	Cont. 93-26 - Hwy. 15,44 - Carleton Place-Almonte	Recycl. H.M. 30/70		57751t
10.	Cont. 93-233 - Hwy. 127 - Lake St. Peter N'ly	Recycl. H.M. 30/70		23766t
11.	Cont. 92-20 - Hwy. 41 - Rankin N'ly	H.L. 4		25288t
12.	Cont. 92-35 - Hwy. 17 - Pembroke	H.L. 3 Mod.		12410t
		Recycl. H.M. 35/65		18743t
13.	Cont. 92-92 - Hwy. 127 - Maynooth	Recycl. H.M. 20/80		16279t

Quality Control to date by Smiths staff has been limited to field tests for aggregate gradation and extraction tests. All other tests including Mix Design, Voids, Recovered Penetration and compaction were performed by qualified consultants. With the recent change in the status of the company involving a close relationship with Miller Paving Limited, which will be apparent from the attached documents in this presentation, we contend that we shall be able to provide full Quality Control of the highest calibre.

Ontario

Ministry of Transportation | Ministère des Transports

Construction Office
355 Counter Street
Postal Bag 4000
Kingston, Ontario
K7L 5A3

Telephone: (613) 540-5158
Facsimile: (613) 545-4786

14 March 1995

Smiths Construction
276 Madawaska Boulevard
P.O. Box 218
Arnprior, Ontario
K7S 3H4

Attention: Mr. Tommy Smith

I would like to take this opportunity to commend Smiths Construction for the initiative shown in the effort to eliminate segregation during the 1994 construction season.

The purchase of the "Paver Hopper Mixer" in conjunction with conscientious paving crews resulted in a much higher quality asphalt mat which the ministry and the asphalt industry as a whole have noted.

With likely enforcement of higher payment adjustments for segregation in the upcoming construction seasons it is good to see companies taking the initiative in the off-seasons to eliminate it from their work. Please pass on my thanks to your paving crews and superintendents, Bob Tryon and Allen Smith, for making my first "part" season as a Q.A.O. enjoyable.

I look forward to working with Smiths Construction again in the upcoming construction season.

Pat Carroll
Q.A.O. (Bituminous)

PC/cmm

c.c.: K. Tam
M. MacLean
D. Kimmett
S. Cheng
D. Pearson
E. Armstrong

Smiths

SMITHS CONSTRUCTION COMPANY ARNPRIOR LIMITED
BOX 218 • 276 MADAWASKA BLVD. • ARNPRIOR, ONTARIO K7S 3H4

Name: Bruce Kenny

Position: Plan Administrator

Company Status: Seasonal 1992 and 1993
Full time since May 1994

Qualifications: Bachelor of Science Degree in Civil Engineering
Queen's University 1994

Experience:

Since 1992, Bruce has gained comprehensive exposure to most aspects of the paving industry. At Smiths Construction his diverse role has included: aggregate process control, asphalt quality control testing, management of quality control personnel, asphalt plant calibration, mix design preparation as well as asphalt troubleshooting.

Bruce Kenny's education and experience coupled with an interest in the Ministry's innovative approach to Quality Assurance makes him an ideal candidate to assume the role of Plan Administrator for Smiths Construction Arnprior Limited.

CURRICULUM VITAE

for

JEREMY DEMELLO

EDUCATION

Civil Engineering Diploma Program
Ryerson Polytechnical Institute, Toronto, Ontario

PROFESSIONAL EXPERIENCE

March 1992 to Present
Laboratory Supervisor,
DBA Engineering Ltd, Markham, Ontario.

Responsible for supervision and training of laboratory testing staff, laboratory testing quality assurance and reporting. Type of service provided includes: inspection and laboratory testing of asphalt, concrete and soil materials, concrete and asphalt plant process control, quarry aggregate process control. Typical project experience includes construction of highways, roads and parking lots.

March 1991 to March 1992
Senior Asphalt Technician,
DBA Engineering Ltd, Markham, Ontario

Responsible for asphalt plant process control testing and reporting, asphaltic concrete mix designs, various asphalt cement testing, concrete and soils laboratory testing.

March 1990 to March 1991
Asphalt technician,
Trow Ltd, Brampton, Ontario

Responsibilities included laboratory testing of bituminous mixtures,and asphalt cement as well as field sampling and inspection, soils and asphalt compaction testing. Typical project experience includes construction of airport refueling facilities, highways, roads, sewers, watermains, parking structures and building foundations.

September 1990 to December 1990
Lab Technician,
Ryerson Polytechnic Institute, Toronto, Ontario.

Responsible for preparing and testing aggregates and asphalt mixtures used for the 1990 Asphalt Laboratory Certification

CURRICULUM VITAE

for

HERB VILLNEFF

PROFESSIONAL EXPERIENCE

1957 to 1960
Surveyor
M.T.O. North Bay District

1960 to 1963
Lab Technican
M.T.O. Northern Region

1963 to 1976
Asphalt Road Inspector
M.T.O. Northern Region

1976 to 1993
Quality Assurance Officer (Bituminous Section)
M.T.O. Northern Region

Retired from M.T.O. in 1993
1993 to Present
Manager of Quality Assurance
Grant Paving & Material Limited
(an affiliate of Miller Paving Limited)

In addition to the normal responsibilities of a Quality Assurance Officer other responsibilities included co-ordinating and presenting Bituminous Construction Courses for 18 years, co-authoring two papers on recycling for presentation at C.T.A.A. and putting on a seminar in Jamaica for the Government of Jamaica.

At Grant Paving responsibilities include training seminars for asphalt paving crews for all companies affiliated with the Miller Group, co-ordinating materials and mix design on M.T.O. projects, training lab technicians for the mobile labs, administering M.T.O. end result specifications and ensuring that the paving crews meet the quality standards required for good asphalt pavements.

Bituminous Laboratory Equipment List

- Thermometers
- Ovens
- Microwave
- Sieves (203 mm diameter)
- Mechanical Sieve Shaker
- Pans
- Balance 10 kg readable to 0.1 g
- Balance 1.5 kg readable to 0.01 g
- Superpave Gyratory Compactor
- Marshall Hammers (manual) - 2
- Hot Plate
- Compaction Block
- Marshall Molds as per ASTM D1559
- Gyratory Compactor Molds
- IBM 486 Computer complete with monitor and printer
- Fan
- Rotarex Extractor
- Extraction Solvent
- Flat bottom scoop
- Garden trowel
- Spatula
- Water Container 75 l
- Wire Basket
- Absorbent Towel
- Water Bath 60.0 °C ± 1°C
- Pine Stability and Flow Machine
- Breaking Head
- Vacuum Cells (4 l)
- Plexiglas Tops with 6mm I.D tee
- Residual Pressure Manometer
- Manifold
- Filter Flasks
- Silica Gel
- Vacuum Pump
- Vacuum Gauge
- Water Bath 25.0 °C ± 1°C
- Tachometer
- Torque Wrench
- Filter Pads
- Drain Tube
- Extract Container
- Aggregate Splitter

APPENDIX B

TEMPERATURE AND MOISTURE PROBES

BY

MTO

RESEARCH AND DEVELOPMENT BRANCH

TEMPERATURE AND MOISTURE PROBES FOR THE SPS-9 SITE, PETAWAWA

Purpose: The primary purpose for the temperature and moisture monitoring instrumentation is to record air and pavement temperature as well as moisture (not required by SHRP) for evaluation of climate-pavement relationships. The air and pavement temperature relationships are used in the SUPERPAVE mix design.

Site Layout: There are two locations for the temperature and moisture monitoring equipment. The two sites are shown in Fig. 1 as follows:

Site A at Sta. 10+025 (Northern Site)

- 7 thermocouple probes below surface
- 1 temperature probe for ambient air temperature
- 2 moisture probes
- telephone communications with Downsview
- site powered by AC power with battery backup

Site B at Sta. 12+235 (Southern Site)

- 7 thermocouples below surface
- 1 temperature probe for ambient air temperature
- 2 moisture probes powered by solar panel
- communication by radio transmitter with Site A
- site powered by solar power with battery backup

The general layout is shown in Fig 2. The equipment cabinet, solar panel and antenna are mounted on a 4m long 51-mm dia. steel tube. The thermocouple and moisture probe lead wires are protected by an underground 19mm conduit

The temperature gradient in the pavement surface layer is measured by 3 thermocouples placed at 12mm, 32mm and 62mm depth of the surface lift Thermocouples are used because they are rugged and have been used by MTO with good success. Additional thermocouples monitor the temperature down to 1.3m. The moisture level is monitored in the Granular A and also the subgrade.

Instrumentation: The instrumentation housed in the pole-mounted equipment cabinet (~30 cm x 30cm x 60cm) consists of:

Site A (Northern)

- Campbell CR 10 data logger (Campbell Scientific, Inc.) with Multiplex unit and a current capability of 32 thermocouples and 4 moisture gauges.
- UHF Radio Link (<5 watts power) for interrogation or data transfer
- Moisture Probes (Campbell Scientific, Inc.) Model CS615-L, Time Domain Reflectometry (TDR).
- Telephone/modem connection to Downsview.

Site B (Southern)

- Radio communication to main station, Site A.
- Solar powered operation.
- Battery pack (up to 26 AMPS) for night-time or cloudy days
- Campbell CR 10 data logger.
- Moisture probes with self-contained electronics, do not require Tektronix TDR oscilloscope

Data Collection: The latest version of on-site CR 10 program will be used to collect and store the temperature and moisture data. Summary statistics and desired measurement frequencies can be set. These include hourly averages, daily averages, daily minimum and maximum readings and the time of measurement

The data collected at Site B (Southern) can be transmitted by radio link to Site A (Northern) and then transferred and down loaded by modem to the Downsview office. This is a convenient method to check and down load a test site in remote areas where electrical power and a telephone line are not available

Data Processing: For processing and storage the LTPP SMP Check software program can be used which was developed under sponsorship of FHWA for the LTPP (Long Term Pavement Performance) program and is specific to the "Seasonal Monitoring Program" (SMP).

.../3

Summary: The described instrumentation constitutes the latest technology in electronic data collection and processing for air temperature, pavement temperatures and moisture content. Most of the equipment has been successfully used at a previous SHRP test site near Hearst, Ontario.

Site 10+025 (test section #6):

- 240 mm of pulverized material
- 65 mm of Granular A

The following is the proposed and current locations of the Thermocouples and the Moisture Probes:

Probe No.	Proposed Location (mm)	Description	**Current Location (mm)	Description
TC#1	12	Surface Course	38.1	Surface Course
TC#2	32	Surface Course	38.1	Surface Course
TC#3	62	Surface Course	38.1	Surface Course
TC#4	130	Binder-Pulverized Interface	120	Binder-Pulverized Interface
MP#1	250	Mid-Pulverized	120	Mid-Pulverized
TC#5	370	Pulverized-Granular A Interface	240	Pulverized-Granular A Interface
TC#6	585	150 mm Below Granular A-Granular B Interface	455	150 mm Below Granular A-Granular B Interface
MP#2	585	Same as above	455	Same as above
TC#7	1275		1145	

**Current Location depths of probes are taken from the surface of the pulverized material.
Note: In the Current TC Location, TC#4 is in the same plane as MP#1 for moisture probe calibration calculations.

- The offset from the steel stake at station 10+025 is 11.26 m and 3 1/2" North of this point to the centre of the conduit and the steel protective box (centred over the conduit)
- The steel protective box is ~1 1/2" below the surface of the Pulverized material.
- Thermocouples #1, #2, #3 are wrapped, taped together and protected under the steel box.

Site 12+235 (test section #3):

- 240 mm of pulverized material
- 170 mm of Granular A

The following is the proposed and current locations of the Thermocouples and the Moisture Probes:

Probe No.	Proposed Location (mm)	Description	Current Location (mm)	Description
TC#1	12	Surface Course	63.5	Surface Course
TC#2	32	Surface Course	63.5	Surface Course
TC#3	62	Surface Course	63.5	Surface Course
TC#4	130	Binder-Pulverized Interface	120	Binder-Pulverized Interface
MP#1	250	Mid-Pulverized	120	Mid-Pulverized
TC#5	370	Pulverized-Granular A Interface	240	Pulverized-Granular A Interface
TC#6	690	150 mm Below Granular A-Granular B Interface	560	150 mm Below Granular A-Granular B Interface
MP#2	690	Same as above	560	Same as above
TC#7	1300		1200	

**Current Location depths of probes are taken from the surface of the pulverized material.
Note: In the current TC placement, TC#4 is in the same plane as MP#1 for moisture probe calibration calculations.

- The offset from the steel stake at station 12+235 is 12.71 m to the centre of the conduit and the steel protective box (centred over the conduit)
- The steel protective box is ~2 1/2" below the surface of the Pulverized material
- Thermocouples #1, #2, #3 are wrapped, taped together and protected under the steel box.

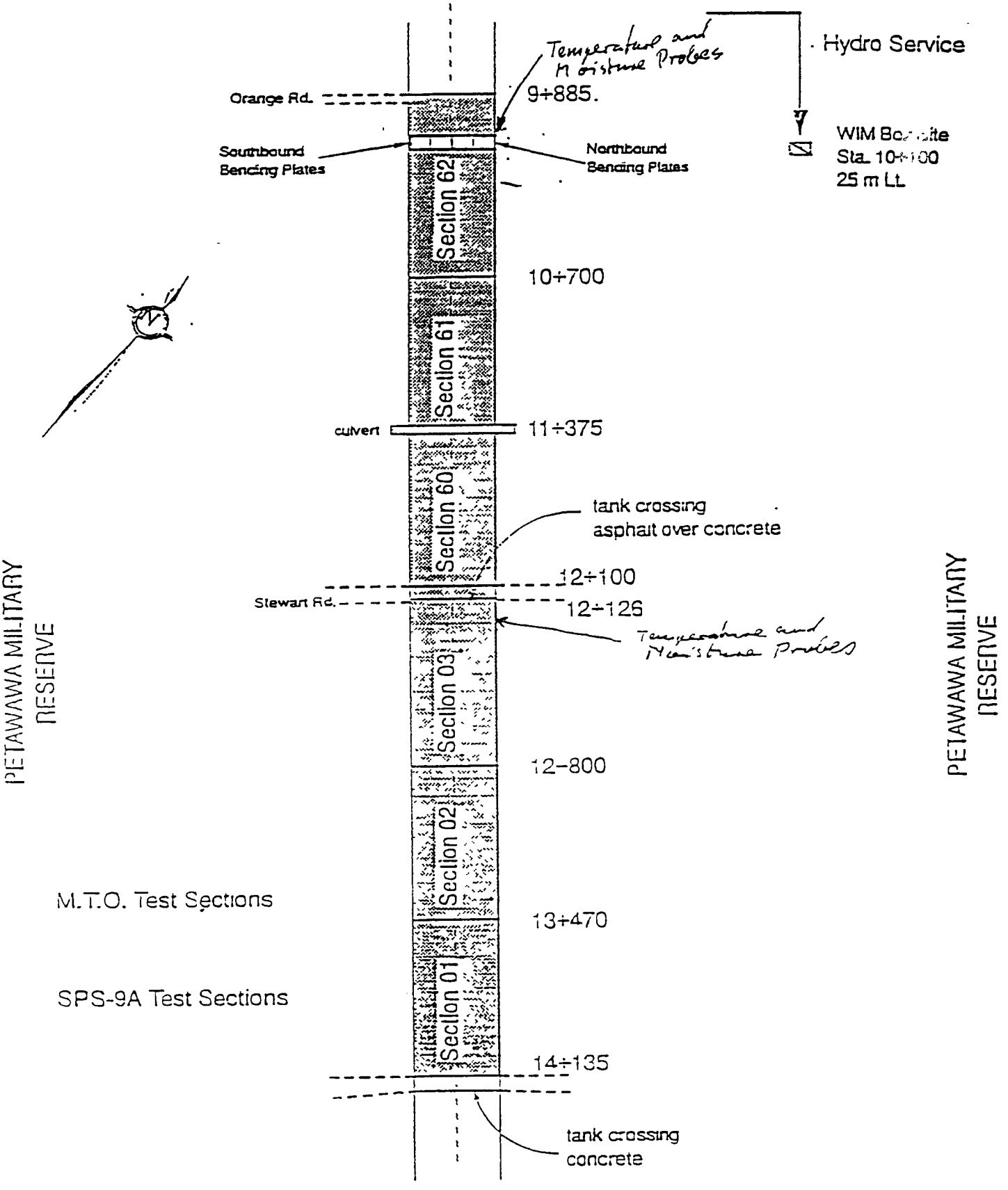

Fig. (1) General Layout

SPS-9A Project. Highway 17N, Petawawa, Ontario

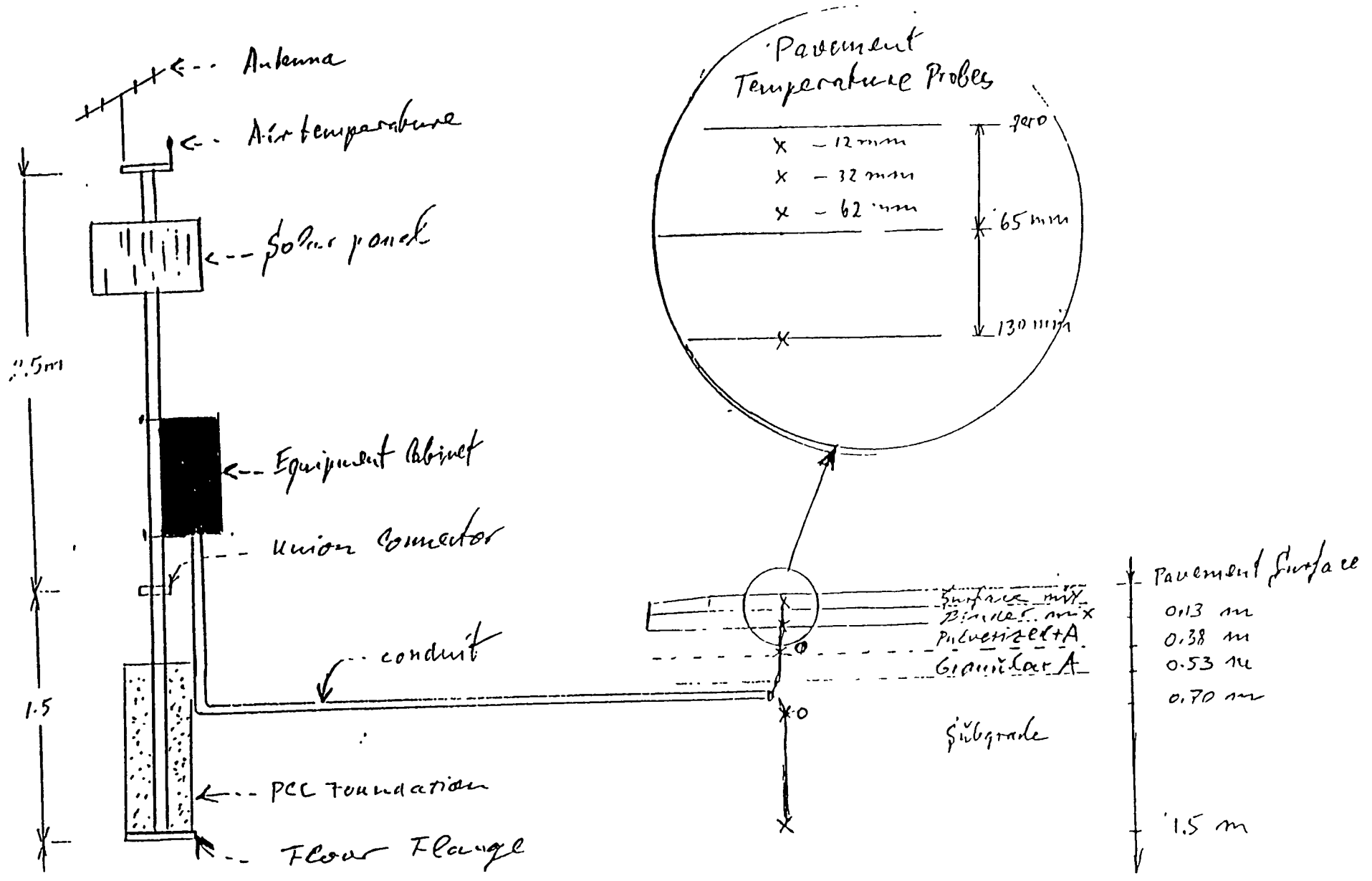

Figure - Layout of Temperature ... at the test Prof

APPENDIX C

12.5mm SUPERPAVE SURFACE COURSE - HOT MIX

DESIGN REPORT (REVISED AND FINAL)

Appendix C4B

12.5 Superpave Mix Design

June 1997

DBA ENGINEERING LTD.

DHILLON BURLEIGH & ASSOCIATES
Consulting Engineers

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Markham, Ontario L3R 0G8
Tel: (905) 940-8383
Toll Free 1-800-819-8833
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FACSIMILE COVER SHEET

TO:	Mr. Anil Virani
COMPANY:	MTO
FAX:	(416) 235-3996
FROM:	
DATE:	
PAGES INCLUDING THIS COVER:	

COMMENTS:

DBA ENGINEERING LTD.

2777 14th Avenue West, Suite 4, Markham, Ontario L3R 0G8

Telephone: Markham: (905) 940-8383 Toll Free: 1-800-819-8833 Fax: (905) 940-8508

HOT MIX DESIGN REPORT (Amendment No. 1)

CONTRACT NO.	96-25	HOT MIX TYPE / USE:	3-C 12.5 Superpave
ITEM NO.:	6		
PROJECT:	MTO Contract 96-25	LOCATION:	From 8.4 km East of Chalk River Easterly to 3.0 km East of Renfrew Rd #28
TESTING LAB.	DBA ENGINEERING LTD.	JOB MIX FORMULA NO. :	
LAB MIX NO.	S-2	DATE SAMPLES RECD.	August 24, 1996
MIX SUPPLIER:	Smith Construction	PLANT LOCATION:	Turcotte Pit
TEST DATA CERTIFIED BY:	P.S. Dhillon, P. Eng.	DATE COMPLETED:	May 20, 1997
		DATE OF AMENDMENT:	June 2, 1997

JOB MIX FORMULA — GRADATION PERCENT PASSING*													
% A.C / Sieve Sizes (mm)	% A.C	26.5	19.0	16.0	12.5	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
JMF	4.9	100	100.0	100.0	99.6	83.6	47.8	32.6	24.6	19.4	13.6	8.2	4.7

MARSHALL	REQUIREMENTS	SELECTED
% VOIDS (min.)	4.0	4.0
(max.)		
FLOW (min) [0.25 mm] @ 3.5 A.V:	0	NA
STABILITY (min) (N)	0	NA
% V.M.A (min)	14	15.6

% CA #1	45.0	% RAP	–
% CA #2	–	%A.C RAP	–
% FA #1	55.0	RAP PEN	–
% FA #2	–	BRIQ. BRD	NA
% FA #3	–	MRD	NA
Gb	2.648	MRD (SD)	NA

ASPHALT CEMENT	
SUPPLIER	PENETRATION
McAsphalt	PG58-40

ADDITIVE		
SUPPLIER	TYPE	AS % OF A.C
Redicote	82-S	0.5

AGGREGATE TYPE	AGGREGATE SOURCE / INVENTORY NO.		AGGREGATE TYPE	AGGREGATE SOURCE / INVENTORY NO.	
COARSE AGG. # 1	HL-3 Stone		FINE AGG. # 2	--	
	Turcotte	P6-74-0		–	–
COARSE AGG. # 2	–		FINE AGG. # 3	--	
	–	–		–	–
FINE AGG. # 1	Stone Dust		RAP	–	
	Turcotte	P6-74-0		–	–

AGG. TYPE	BULK REL. DENSITY	ABSORPTION %	AGGREGATE GRADATION — PERCENT PASSING											
			26.5	19.0	16.0	12.5	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
CA #1	2.636	0.86	100.0	100.0	100.0	99.0	63.6	3.4	3.0	2.5	2.2	1.8	1.5	1.2
CA #2														
FA #1	2.657	0.58	100.0	100.0	100.0	100.0	100.0	84.2	58.9	42.7	33.5	23.1	13.7	7.5
FA #2														
FA #3														
RAP CA														
RAP FA														

* FINES RETURNED TO MIX (0%)

REMARKS: 1 The briquettes were compacted with a Gyratory Compactor @ 160 C.

REVIEWED BY: _____ DATE _____

Dust Proportion (Fines/Pbe) Worksheet

	Inputs			
	Blend 1	Blend 2	Blend 3	Blend 4
Specific Gravity of Binder(Gb):	1.020	1.020	1.020	1.020
Fines (% Passing .075mm Sieve)	4.7	4.7	4.7	4.7

	Outputs			
Absorbed binder: % by wt. of aggregate (Pba)	0.243	0.264	0.231	0.249
Absorbed binder: % by total wt. of mixture (Pba')	0.232	0.252	0.220	0.236
Percent AC (Pbl)	4.3	4.6	4.9	5.2
Effective Specific Gravity (Gse)	2.665	2.666	2.664	2.665
Effective % Binder (Pbe)	4.068	4.348	4.680	4.964
Dust Proportion (Fines/Pbe)	1.2	1.1	1.0	0.9

Project Name:	MTO Contract 96-25	N Initial:	7
Technician:	Andrew Burleigh	N Design:	86
Date:	5/31/97	N Max:	134
Asphalt Grade:	PG58-40	Design Temperature:	38 °C
Compact. Temp:	150 °C	Design ESAL's (millions):	3

4.3

#Gyr	Specimen 1 Ht (mm)	Specimen 1 %Gmm (Est.)	Specimen 1 %Gmm (Corr)	Specimen 2 Ht (mm)	Specimen 2 %Gmm (Est.)	Specimen 2 %Gmm (Corr)	Specimen 3 Ht (mm)	Specimen 3 %Gmm (Est.)	Specimen 3 %Gmm (Corr)	Avg.
7	132.2		86.3	132.0		86.6				86.4
86	120.9		94.4	120.8		94.5				94.4
134	119.4		95.6	119.3		95.7				95.6
Gmb	2.382			2.384			0.000			
Gmm	2.492									

4.6

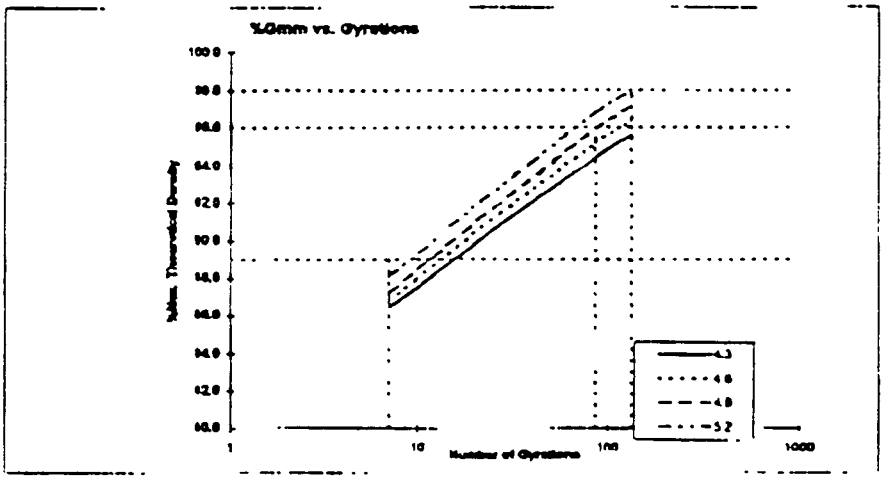
#Gyr	Specimen 1 Ht (mm)	Specimen 1 %Gmm (Est.)	Specimen 1 %Gmm (Corr)	Specimen 2 Ht (mm)	Specimen 2 %Gmm (Est.)	Specimen 2 %Gmm (Corr)	Specimen 3 Ht (mm)	Specimen 3 %Gmm (Est.)	Specimen 3 %Gmm (Corr)	Avg.
7	132.4		86.7	131.5		86.9				86.8
86	120.7		95.1	120.0		95.2				95.2
134	119.2		96.3	118.5		96.5				96.4
Gmb	2.390			2.394			0.000			
Gmm	2.482									

4.9

#Gyr	Specimen 1 Ht (mm)	Specimen 1 %Gmm (Est.)	Specimen 1 %Gmm (Corr)	Specimen 2 Ht (mm)	Specimen 2 %Gmm (Est.)	Specimen 2 %Gmm (Corr)	Specimen 3 Ht (mm)	Specimen 3 %Gmm (Est.)	Specimen 3 %Gmm (Corr)	Avg.
7	132.4		87.2	131.8		87.2				87.2
86	120.4		95.9	119.8		95.9				95.9
134	118.9		97.1	118.2		97.2				97.2
Gmb	2.398			2.400			0.000			
Gmm	2.469									

5.2

#Gyr	Specimen 1 Ht (mm)	Specimen 1 %Gmm (Est.)	Specimen 1 %Gmm (Corr)	Specimen 2 Ht (mm)	Specimen 2 %Gmm (Est.)	Specimen 2 %Gmm (Corr)	Specimen 3 Ht (mm)	Specimen 3 %Gmm (Est.)	Specimen 3 %Gmm (Corr)	Avg.
7	130.3		87.8	129.4		88.3				88.0
86	118.3		96.7	117.9		96.9				96.8
134	116.8		98.0	116.5		98.0				98.0
Gmb	2.409			2.411			0.000			
Gmm	2.459									



Project Name:	MTO Contract 96-25	**N Initial:**	7
Technician:	Andrew Burleigh	**N Design:**	86
Date:	5/31/97	**N Max:**	134
Asphalt Grade:	PG58-40	**Design Temperature:**	38 °C
Compaction Temp:	150 °C	**Design ESAL's (millions):**	3

Blend	%AC	%Gmm @ N = 7 (corrected)	%Gmm @ N = 86 (corrected)	%Gmm @ N = 134 (corrected)	%Air Voids @ NDesign	%VMA @ NDesign
4.3	4.3	86.4	94.4	95.6	5.6	14.9
4.6	4.6	86.8	95.2	96.4	4.8	14.9
4.9	4.9	87.2	95.9	97.2	4.1	15.0
5.2	5.2	88.0	96.8	98.0	3.2	14.8

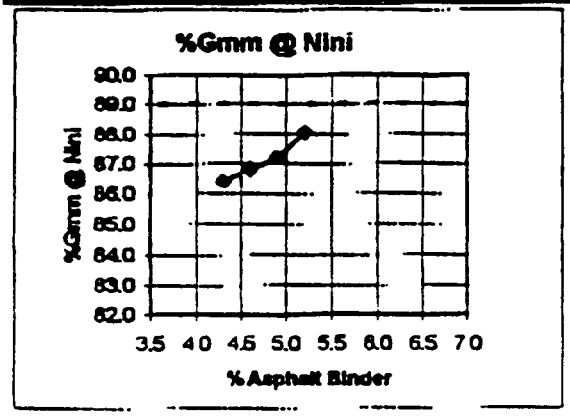
Blend	Estimated %AC @ 4% Va	Estimated %Gmm @ N = 7	Estimated %Gmm @ N = 86	Estimated %Gmm @ N = 134	Estimated %VMA @ NDesign	Estimated %VFA @ NDesign
4.3	4.9	88.0	96.0	97.2	14.6	72.7
4.6	4.9	87.6	96.0	97.2	14.7	72.8
4.9	4.9	87.3	96.0	97.3	14.9	73.2
5.2	4.9	87.2	96.0	97.2	14.9	73.1

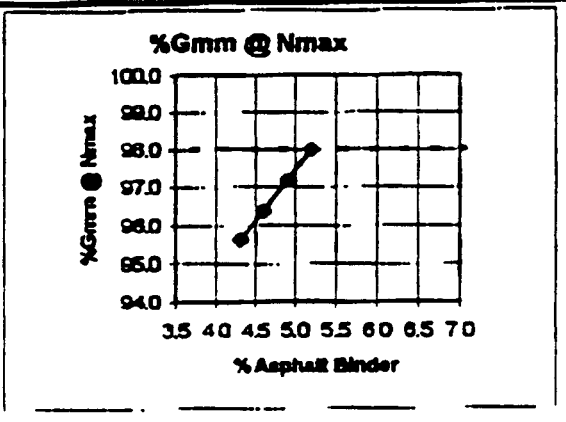
Project Name: MTO Contract 96-25
Technician: Andrew Burleigh
Date: 5/31/97

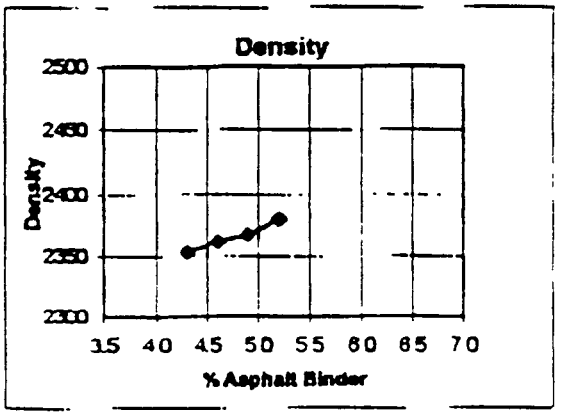
N Initial: 7
N Design: 86
N Max: 134

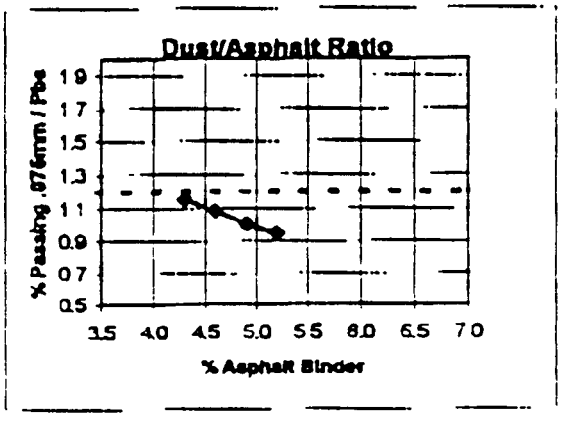
Asphalt Grade: PG58-40
Compaction Temp: 150 °C

Design Temperature: 38 °C
Design ESAL's (millions): 3



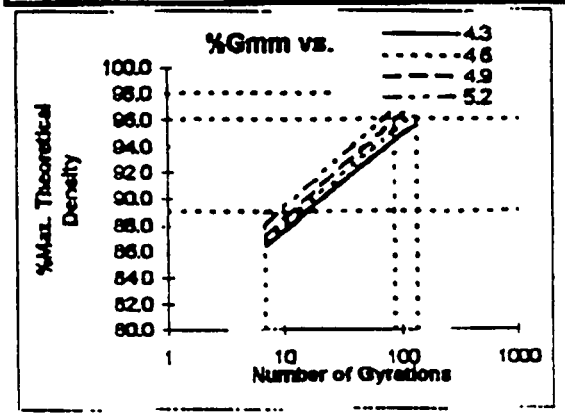


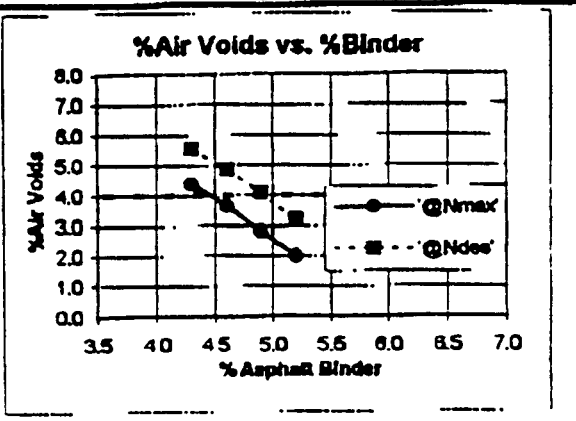


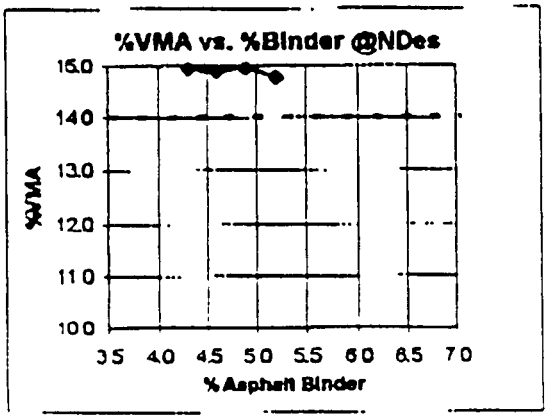


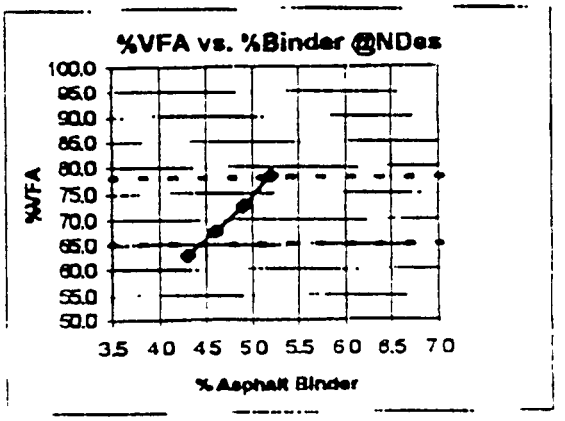
Blend	%AC	%Gmm @ Ninitial	%Gmm @ NMax	Unit Wt. (kg/m^3) NDesign	Dust/Asph Ratio
4.3	4.3	86.4	95.6	2353	1.2
4.6	4.6	86.8	96.4	2362	1.1
4.9	4.9	87.2	97.2	2368	1.0
5.2	5.2	88.0	98.0	2380	0.9

Project Name:	MTO Contract 96-25	**N Initial:**	7
Technician:	Andrew Burleigh	**N Design:**	86
Date:	5/31/97	**N Max:**	134
Asphalt Grade:	PG58-40	**Design Temperature:**	38 °C
Compaction Temp:	150 °C	**Design ESAL's (millions):**	3



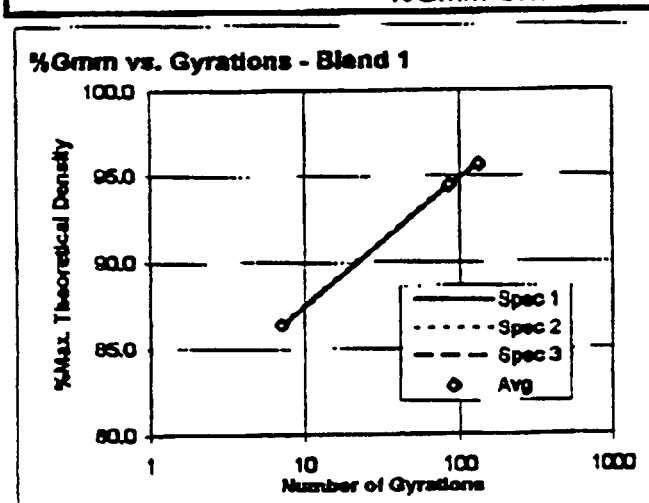


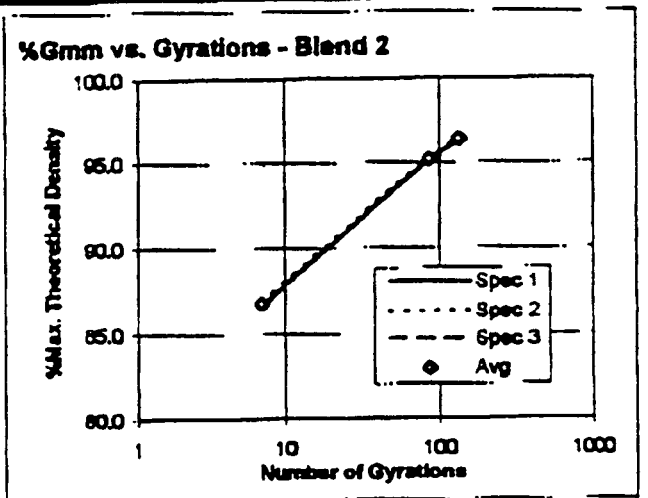


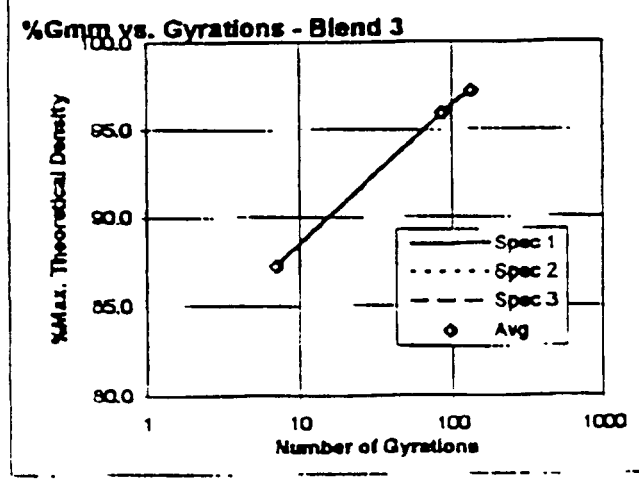


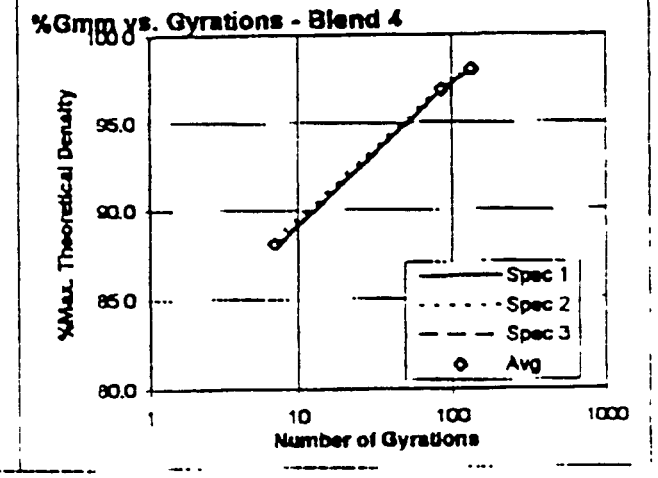
Blend	%AC	Air Voids @ NMax	Air Voids @ NDesign	%VMA NDesign	%VFA @ NDesign
4.3	4.3	4.4	5.6	14.9	62.8
4.6	4.6	3.6	4.8	14.9	67.6
4.9	4.9	2.8	4.1	15.0	72.7
5.2	5.2	2.0	3.2	14.8	78.4

%Gmm Charts for Individual Specimens









Performance Grade Binder Verification Report

Project No.: 96-846

Date: July 5, 1997.

Client: **Smith Construction**
Address: PO Box 218
276 Madawaska Blvd.
Armprior, Ontario.
K7S 3H4

Supplier: Smith
Sampled at: Section #1
Identification: 85-100
Lab No.: 2790
Tested By: S. Jackson
Date Sampled: June 9,1997.

Attention: Mr. Bruce Kenny

Tests on Original Binder	
Viscosity (ASTM D4402) at 135 o C, Pa.s (3.0 Pa.s Maximum)	0.328
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (1.0 kPa Minimum)	2.2794
Tests on RTFO Residue	
Mass Loss, AASHTO T240, percent(1.0% Maximum)	0.237
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (2.2 kPa Minimum)	6.2541
Tests on PAV Residue	
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (5000 kPa Maximum)	3064.8
Creep Stiffness, AASHTO TP1: S., MPa (300 MPa Maximum)	110
Slope of Log Creep Stiffness v Log Time, AASHTO TP1: m-value (0.300 Minimum)	0.351
Physical Hardening, AASHTO TP1: Creep Stiffness, S, MPa, and Slope of Log Creep Stiffness v. Log Time, m-value, 24 hours conditioning	

Andrew Burleigh, C.E.T
Manager Technical Services

Performance Grade Binder Verification Report

Project No.: 96-846

Date: July 21, 1997.

Client: **Smith Construction**
Address: PO Box 218
276 Madawaska Blvd.
Armprior, Ontario.
K7S 3H4

Supplier: Smith
Sampled at: Section #02
Identification: PG 58-40
Lab No.: 2794
Tested By: S. Jackson
Date Sampled: June 10,1997

Attention: Mr. Bruce Kenny

Tests on Original Binder	
Viscosity (ASTM D4402) at 135 o C. Pa.s (3.0 Pa.s Maximum)	0.630
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (1.0 kPa Minimum)	3.2934
Tests on RTFO Residue	
Mass Loss, AASHTO T240, percent(1.0% Maximum)	0.204
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (2.2 kPa Minimum)	5.6354
Tests on PAV Residue	
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (5000 kPa Maximum)	1852.5
Creep Stiffness, AASHTO TP1: S., MPa (300 MPa Maximum)	198
Slope of Log Creep Stiffness v. Log Time, AASHTO TP1 m-value (0.300 Minimum)	0.318
Physical Hardening, AASHTO TP1: Creep Stiffness, S, MPa, and Slope of Log Creep Stiffness v. Log Time, m-value, 24 hours conditioning	-

Andrew Burleigh, C.E.T
Manager Technical Services

Performance Grade Binder Verification Report

Project No.: 96-846

Date: July 21, 1997.

Client: **Smith Construction**
Address: PO Box 218
276 Madawaska Blvd.
Armprior, Ontario.
K7S 3H4

Supplier: Smith
Sampled at: Section 03
Identification: PG 58-34
Lab No.: 2791
Tested By: S. Jackson
Date Sampled: June 11,1997

Attention: Mr. Bruce Kenny

Tests on Original Binder	
Viscosity (ASTM D4402) at 135 o C, Pa.s (3.0 Pa.s Maximum)	0.635
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (1.0 kPa Minimum)	2.6831
Tests on RTFO Residue	
Mass Loss, AASHTO T240, percent(1.0% Maximum)	0.222
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (2.2 kPa Minimum)	5.6321
Tests on PAV Residue	
Dynamic Shear, AASHTO TP5: G*/Sin∂ @ 10 rad/s, kPa (5000 kPa Maximum)	3467.9
Creep Stiffness, AASHTO TP1. S., MPa (300 MPa Maximum)	257
Slope of Log Creep Stiffness v Log Time. AASHTO TP1: m-value (0.300 Minimum)	0.309
Physical Hardening, AASHTO TP1: Creep Stiffness, S, MPa, and Slope of Log Creep Stiffness v Log Time, m-value, 24 hours conditioning	

Andrew Burleigh, C.E.T
Manager Technical Services

APPENDIX D

PROJECT DEVIATION REPORT

LTPP SPS Project Deviation Report Project Summary Sheet	State Code 8 7 Project Code 0 9 0 0

Project Classification Information

SPS Experiment Number: 9A	State or Province: ON
LTPP Region: ☒ North Atlantic ☐ North Central ☐ Southern ☐ Western	
Climate Zone: ☐ Dry-Freeze ☐ Dry-No Freeze ☒ Wet-Freeze ☐ Wet-No Freeze	
Subgrade Classification: ☐ Fine Grain ☒ Coarse Grain ☐ Active (SPS-8 Only)	
Project Experiment Classification Designation (SPS 1, 2 and 8):	
Construction Start Date: pulverize Sept. 16/96	Construction End Date: June 19/97
FHWA Incentive Funds Provided to Agency for this Project: ☐ Yes ☒ No	

Deviation Summary

Site Location Deviations:	☒ No Deviations ☐ Minor Deviations ☐ Significant Deviations
Construction Deviations:	☐ No Deviations ☒ Minor Deviations ☐ Significant Deviations

Data Collection and Processing Status Summary

Inventory Data (SPS 5,6,7,9):	☐ Complete Submission ☐ Incomplete ☐ Data Not Available
Materials Data:	☒ All Scheduled Samples Obtained ☒ No Test Data
Construction Data:	☒ All Required Data Obtained ☐ Incomplete/Missing Data Elements
Historical Traffic Data:	☐ All Required Historical Estimates Submitted (SPS 5,6,7,9) ☐ Required Estimates Not Submitted
Traffic Monitoring Equipment:	☒ WIM Installed On-Site ☒ AVC Installed On-Site ☐ ATR Installed On-Site ☐ No Equipment Installed
Traffic Monitoring: ☒ Preferred ☐ Continuous ☐ Minimum ☐ Below Minimum ☐ Site Related	
Traffic Monitoring Data:	☐ Monitoring Data Submitted ☐ No Monitoring Data Submitted
FWD Measurements:	☐ Preconstruction Tests Performed ☐ Construction Tests Performed ☐ Post-construction Tests Performed
Profile Measurements:	☒ Preconstruction Tests Performed ☒ Post-construction Tests Performed
Distress Measurements:	☐ Preconstruction Tests Performed ☐ Post-construction Tests Performed
Maint. & Rehab. Data:	☐ Complete Submission ☐ Incomplete ☒ Data Not Available
Friction Data:	☐ Complete Submission ☐ Incomplete ☐ Data Not Available

Report Status

Materials Sampling and Test Plan:	☒ Document Prepared ☐ Final Submitted to FHWA
Construction Report:	☒ Document Prepared ☐ Final Submitted to FHWA
AWS: (SPS 1, 2, & 8)	☐ AWS Installed ☐ AWS Installation Report Submitted to FHWA

 Preparer A. Rutka Date 01-08-98

LTPP SPS Project Deviation Report Site Location Guidelines Deviations	State Code 8 7 Project Code 0 9 0 0

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Site Location Guideline Deviation Comments

NONE

 Preparer A. Rutka Date 01-08-98

LTPP SPS Project Deviation Report Construction Guidelines Deviations	State Code 8 7 Project Code 0 9 0 0

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Construction Guidelines Deviation Comments

-the average thickness (combined binder and surface courses) of the 6 test sections was 139 mm (average binder 73mm, average surface 66mm). On the basis of ± 6mm tolerance, the following test sections fall outside of this tolerance: 01 (151mm) 02 (150mm) 60 (130mm) and 61 (127mm).

-the following surface course test sections fall outside the minimum 65mm requirements: 02 (59mm) and 61 (64mm).

-all of the binder course was laid in the fall of 1996 and the surface course in the spring of 1997, thus over 2 construction seasons. This is of interest more than a deviation.

 Preparer A. Rutka Date 01-08-98

LTPP SPS Project Deviation Report Data Collection and Materials Sampling and Testing Deviations	State Code 8 7 Project Code 0 9 0 0

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Data Collection & Material Sampling and Testing Deviation Comments

-the profile index was obtained using a 0mm blanking band. The 5mm profile index was obtained from correlation studies previously carried out by MTO.

NOTE: Laboratory testing is presently underway and the tests to be carried out will follow the test shown in the tracking tables.

01-08-98

LTPP SPS Project Deviation Report Other Deviations	State Code 8 7 Project Code 0 9 0 0

☐ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Other Deviation Comments

NONE

 Preparer A. Rutka Date 01-08-98

APPENDIX E

PHOTOGRAPHS

Photo 1: 5000 lb. Pioneer Batch Plant at Smith Turcotte Pit

Photo 2: Pulverizer is needed to loosen surface of frozen pulverized base for fine grading prior to paving

Photo 3: Paving Train. CAT AP1000 Paver, MTV Roadtex 5B2500 (Shuttlebuggy) Grader ahead fine-grading the pulverized base

Photo 4: Potholed condition of top of pulverized base in EBL while laying asphalt binder course in WBL

Photo 5: Nuclear Density Measurement of pulverized base

Photo 6: Checking nominal thickness with level just behind paver prior to compaction. Equipment also used to take 5-point cross section levels at 15.2m intervals

Photo 7: Illustrating pick-up of binder course in section 3, a PG 58-34 with polymer modification

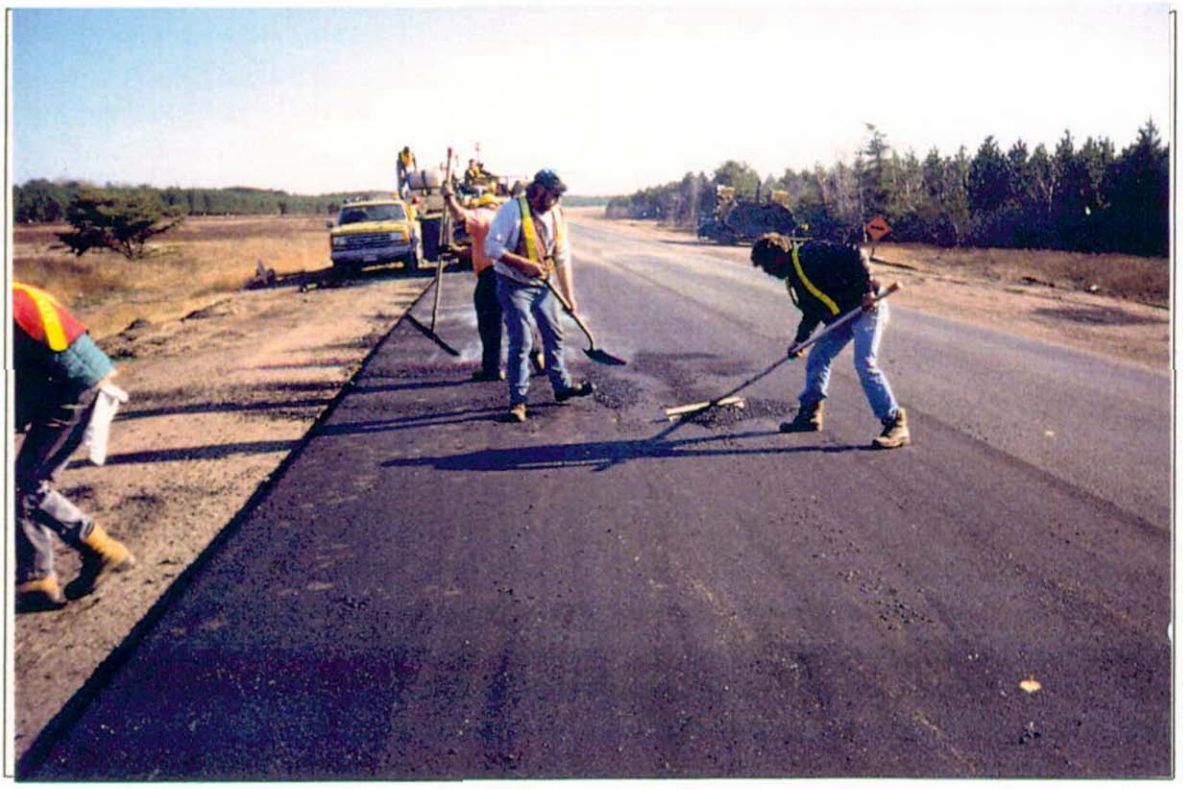


Photo 8: Patching areas of top of binder disturbed by roller pickup

Photo 9: Dynapac 20T intermediate rubber tired roller and Galion finishing steel wheel tandem roller

Photo 10: Thermocouples are exposed after paving

Photo 11: Grader raises shoulder material against uncompacted asphalt mat prior to rolling

Photo 12: Too-heavy SS-1 tack coat prior to placing surface course

Photo 13: Bulk Sample of Plant Mix being taken from the "Shuttlebuggy" and placed in cardboard boxes

Photo 14: 6" diameter cores with typical sample ID, CA11A02, with traffic direction arrow